THE REPTILES.

I. TURTLES, LIZARDS, AND ALLIGATOR.

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Although the Okefinokee Swamp represents one of the most interesting regions in the southeastern United States for the study of reptilian life, practically no records have been made of this part of its fauna. The following paper is intended as a preliminary contribution toward a knowledge of the herpetology of this area—an area which is sure to prove a rich field for zoological work when suitable provision has been made to render its interior more accessible.

Few attempts have been made to enter the Okefinokee for scientific purposes. The swamp, in its earlier history, was a centre for beautiful Indian legends and mythical tales; in later times, this pathless wilderness occasioned a weird medley of stories, many of which reflect its supposedly dangerous attributes. The miasmatic effect of the "black mud, the stench from which soon became so intolerable as to induce vomiting," impresses Captain Rodenbough (1838)[1] as its worst characteristic; while another considers it "very dangerous to the health of man especially to recent arrivals in the country; . . . . in the Okefinokee mosquitoes sometimes rise in such swarms that the trees are only seen dimly as through a dust-storm." But with natives and travellers alike, a deterrent more powerful than either of these beliefs are the dreaded reptiles within its borders. Paul Fountain,[2] in his *A Day in a Cypress Swamp* (Okefinokee), devotes practically his entire chapter to these cold-blooded creatures. He says: "A greater number of reptiles may be found in this swamp than in any other spot I know of in the States," and our experience proves it a veritable paradise for the herpetologist.

Professor A. M. Reese,[3] when searching for clues to the breeding habits of the alligator, made a trip to the Okefinokee in the summer of 1905. He says:

"In the summer of 1906 the Okefinokee was again visited; this time the swamp was penetrated to its centre, and nearly one hundred alligators were killed by the three hunters with whom I was travelling. It is this vigorous hunting, done chiefly at night, with a bull's-eye lantern and shot-gun, that has so diminished the number of alligators, where, twenty years ago, hundreds

[1] Rodenbough, T. F. From everglades to canon with the Second Dragoons 1836–1875. New York. 1875. Pp. 31, 32.

[2] Fountain, Paul. The great deserts and forests of North America. London and New York. 1901. Pp. 52–66.

[3] Reese, A. M. The breeding habits of the Florida Alligator. *Smithsonian Miss. Colls. XLVII (Quarterly Issue, Vol. III.)* 1907. Pp. 381, 382.

could be seen, to-day scarcely one may be found. It seems a very wanton destruction of life to kill so many of these large animals, especially when it is remembered that a large alligator hide is worth to the hunter only about $1.50."

"Just how soon (if at all) the alligator is likely to be exterminated in our Southern States it is impossible to say, but so long as those two great swampy wastes, the Everglades and the Okefinokee, remain undrained, the great American reptile is not likely to become entirely extinct."

Of this same form we have the very interesting account of Andrew Ellicott,[4] who served as the United States Commissioner to determine the boundary between Florida and Georgia in 1800. With the Spanish Commissioner, he started up the St. Mary's January 23, and returned March 3; and his mounds "A" and "B" have been the subject of many memorials by both Florida and Georgia. He writes:

"This being the season that the Alligators, or American crocodiles were beginning to crawl out of the mud and bask in the sun, it was a favorable time to take them, both on account of their torpid state, and to examine the truth of the report of their swallowing pine knots in the fall of the year to serve them, (on account of their difficult digestion) during the term of their torpor, which is probably about three months. For this purpose two Alligators of about eight or nine feet in length were taken and opened, and in the stomach of each were found several pine and other knots, pieces of bark, and in one of them some charcoal; but exclusive of such indigestible matter, the stomachs of both were empty. So far the report appears to be founded in fact; but whether these were swallowed on account of their tedious digestion, and therefore proper during the time those animals lay in the mud, or to prevent the collapse of the coats of the stomach, or by accident owing to their voracious manner of devouring their food, is difficult to determine.

"The Alligator has been so often, and so well described, and those descriptions are so well known, that other attempts have become unnecessary. It may nevertheless be proper to remark that so far as the human species are concerned, the Alligators appear much less dangerous than has generally been supposed, particularly by those unacquainted with them. And I do not recollect meeting with but one well authenticated fact of any of the human species being injured by them in that country, (where they are very numerous,) and that was a negro near New Orleans, who while standing in the water sawing a piece of timber, had one of his legs dangerously wounded by one of them. My opinion on this subject is founded on my own experience. I have frequently been a witness to Indians, including men, women and children, bathing in rivers and ponds, where those animals are extremely numerous, without any apparent dread or caution: the same practice was pursued by myself and people, without caution, and without injury.

"Some of the Alligators we killed were very fat, and would doubtless have yielded a considerable quantity of oil, which is probably almost the only use that will ever be made of them; however their tails are frequently eaten by the Indians and negroes, and Mr. Bowles informed me that he thought them one of the greatest of delicacies.

"The Alligators appear to abound plentifully in musk, the smell of which is sometimes perceptible to a considerable distance, when they are wounded or killed; but whether the musk is contained in a receptacle for that purpose, and secreted by a particular gland or glands, or generally diffused through the system appears somewhat uncertain: and I confess their appearance was so disagreeable and offensive to me, that I felt no inclination to undertake the dissection of one of them."

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[4] Ellicott, Andrew. The Journal of, etc. Philadelphia, 1803. Pp. 276–278.

The bulk of the material described in the present paper was obtained by the expedition from Cornell University during the summer of 1912, at which time the swamp was entered from the southwestern side and a permanent camp established on Billy's Island, located in the centre of the swamp. From this camp side trips were made from time to time throughout the summer, and a fairly accurate idea of the geography and biology of the region was obtained.

Most valuable services were rendered to this party by the Lee family, living on Billy's Island, the only human inhabitants of the interior of the swamp, and practically out of touch with the outside world. Their primitive mode of living had adapted them to a marvellous degree to the appreciation of the wild life about them, and their observations and knowledge of natural phenomena proved to be surprisingly accurate. The older men and boys were indispensable as guides while the party was in the swamp, and on the exit of the party a container was left with them to be filled with specimens which might come to their hands later in the year. This container, full of material chosen with evident care and good judgment, was received November 15, 1912, and the specimens thus secured proved a valuable addition to those previously collected. In December, 1913, data were obtained on the winter condition of some of the forms here noted.

The list of species here described is of course hardly more than a check-list of those reptiles noted during the two months which the party spent in the Okefinokee, and is no doubt very incomplete as regards the extent of the reptilian fauna of the swamp, but it is hoped that it will serve as a basis for future work and as an aid to systematic zoologists interested in the forms of the region under discussion.

Acknowledgments are due to Dr. Leonard Stejneger, of the United States National Museum, for the privilege of examining types in the Museum collection, and to Mr. R. W. Bennett and Mr. Cornelius, of Fargo, Ga., without whose courteous assistance it would have been impossible to have transported our material out of the swamp.

The nomenclature and synonymy here adopted is that of Arthur E. Brown in *Generic Types of Nearctic Reptilia and Amphibia*.[5]

[5] Proceedings of the Academy of Natural Sciences of Philadelphia, Apr., 1908, pp. 112–127.

Testudinata.

1. **Macroclemmys temminckii** Troost. Plate I, fig. 3.

The alligator snapper, called by the natives "gator terrapin" or "loggerhead," was reported as being common in the Okefinokee, but very few specimens were seen by our party. No adults were collected. The presence of the alligator snapper in the Okefinokee carries its range eastward to the easternmost Gulf tributary (the Suwannee) and the former eastern boundary of old West Florida. Its association here with *Chelydra serpentina* suggests that the latter may have been an Atlantic coast contribution through the St. Mary's.

This turtle is said to attain a large size in its natural habitat in the lakes of this region, and some evidence was secured to bear out this statement. A specimen about eight inches in length was captured June 17 and placed in a "bee-gum" for safekeeping. On the return to the spot the next day, the turtle had escaped. Dave Lee stated that he had seen turtles with the head alone as large as the shell of this specimen. A skull of *Macroclemmys temminckii* with the lower mandible missing was found on one of the islands, and it proved by its measurements that this turtle approaches such a size. This skull, old and much weathered, agrees exactly with Boulenger's figure[6] in the arrangement of bones and sutures and in the position of the fossæ. It measures as follows:

Maximum length $6\frac{1}{2}$ inches, maximum width 6 inches, width between centres of orbital sockets $2\frac{1}{2}$ inches, diameter of orbit 1 inch, distance from eye to snout (between openings) 1 inch, height of upper mandible at anterior hook 2 inches, maximum width of upper mandible (at posterior angle) 4 inches, width of nasal opening 1 inch.

In connection with this data, a large scale, probably from the shell of an "alligator snapper," was found in the swimming hole at the boat landing on Billy's Island, June 9, 1912. This scale is flat, thin, hard and fan-shaped; on the upper surface eight radiating longitudinal ridges and numerous close, concentric, subparallel transverse grooves, the under surface smooth and slightly undulating. The scale is dry and brittle, much weathered and inclined to peel on the upper surface and is the cephalic scale of one of the costal series. Maximum length $5\frac{1}{2}$ inches, maximum width $5\frac{1}{2}$ inches, slightly broken on one side at distal angle.

No eggs of this turtle were collected.

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[6] British Museum Catalogue, Chelonians, 1889, p. 24, fig. 5.

2. **Chelydra serpentina** (Linnæus). Plate I, fig. 5; II, fig. 5.

Two young snapping turtles were brought out of the swamp and at the time were not carefully examined, but were supposed to be young of the alligator snapper. On comparison with similar-sized representatives of *Chelydra serpentina* taken at Ithaca, N. Y., they prove to be identical with the northern specimens. They are without the scalloped anterior margin of *M. temminckii* young, as represented by Agassiz[7] and do not possess the striking papillæ of the young of the alligator snapper. The orbits are directed outwards and upwards as in *C. serpentina* and wholly unlike the condition in the large skull of *M. temminckii* secured in the swamp. Furthermore, no supramarginals appear in the carapace. The specimens are small, the larger having a shell $1\frac{7}{8}$ inches long by $1\frac{1}{2}$ inches wide. A brief description may be given as follows:

Carapace grayish-black; very rough; three distinct ridges, the central highest; vertebral plates distinctly serrate at edges, inclined to overlap, each plate roughly bifid posteriorly; marginal plates thick, narrow, edges smooth anteriorly, strongly toothed posteriorly. Plastron acute posteriorly; black with white marginal markings. Head gray, skin tuberculate, white spot below angle of mandible on each side. Neck black, skin loose and wrinkled. Legs black, unmarked. Skin of head, neck, legs and under surface of body gray or black, rough and finely tuberculate. Tail long, black, spiny above, smooth below, gradually narrowing to apex.

3. **Cinosternum pennsylvanicum** Bosc. Plate II, fig. 3.

It is one of the common turtles of the swamp, found both on land and in the water. These turtles were often seen in the shallower waters of the lakes and in the ponds on the islands and frequently on the higher portions of the wooded areas where they came to deposit their eggs.

The specimens collected showed practically no variation in structure or coloration, and the adult as represented in the Okefinokee fauna may be briefly described as follows:

Carapace smooth and comparatively high; uniform dark brown in color without markings, but occasionally with fine obsolete indented lines; marginal plates narrow, brown above and reddish-yellow below with brown markings on under side; both extremities of carapace obtusely rounded. Plastron loosely hinged, not completely covering fleshy parts, especially posteriorly, deeply notched

[7] Natural History of the United States, Vol. II, Part III, Plate V, Nos. 23–27.

behind; reddish-yellow, with deep brown rectangular grooves at inner and posterior edges of plates; interstices between hinges, and sutures between plates wide. Neck long; skin loose and much wrinkled; black above, sordid white beneath. Head comparatively large; black or brown above, occasionally spotted with yellow or greenish-yellow on sides, uniform white or yellow beneath; upper mandible with strong curved blunt hook. Legs unmarked, brown-black; claws long, strong and sharp. Tail thick and suddenly acuminate at extremity. Average length of carapace $3\frac{1}{2}$ inches, width $2\frac{1}{4}$ inches; plastron $3\frac{1}{4}$ inches in length by 2 inches in width; height of shell $1\frac{1}{2}$ inches; width of head $\frac{7}{8}$ inch.

The time during which the specimens were collected (May and June) seemed to be the egg-laying season. A fine large female (C. U., No. 6,456) was taken on the nest in the act of egg-laying, June 11, 1912, and three eggs were found with the specimen. The nest was in rotten wood by the side of a dead log and the eggs were deposited at a depth of three inches below the surface of the decayed wood. In the stomach of a king snake (*Ophibolus getulus*) (C. U., No. 6,138) taken on Billy's Island, June 11, 1912, was found one egg of *Cinosternum pennsylvanicum*, together with two eggs of *Chrysemys floridana*. Another king snake (C. U., No. 6,146) taken on Billy's Island had what was apparently the shells of Cinosternum eggs in its stomach, and a third snake of the same species also taken on Billy's Island had in its stomach a large number of crushed and finely broken shells of the same kind of eggs. Finally, Mr. Harper relates how he and Dave Lee stumbled upon a king snake, and when they had recovered they found a small Cinosternum digging in the sand—all of which seems strong circumstantial evidence to prove the snake was on hand to scoop the eggs the instant they were laid. These turtles, therefore, evidently come up to the woody parts of the islands during this season to deposit their eggs, which often furnish food for the snakes and, according to the Lees, also for other animals of the swamp.

A number of the eggs of this turtle were collected, but owing to the evaporation of the liquid from the containers in which they were placed, none were preserved in a condition satisfactory for accurate description or measurements. The eggs were elliptical, approximately 30 mm. long by 15 mm. in diameter and of a pinkish-white color. The shells seem to be slightly more brittle and apparently less granular than those of *Chrysemys floridana*.

4. **Sternothœrus carinatus** (Gray).

Two specimens of musk turtles, agreeing with each other in every particular of structure and markings, were taken in the Okefinokee. These specimens represent an interesting form of *S. carinatus*. They differ from the normal in that the distinct black spots of the head are very obsolete and the black streaks or spots of the carapace, usually so prominent, are almost absent or only faintly visible. The gular shield is very small, a raised boss or knob.

The carapace is very rough, the vertebral plates sharp and inclined to overlap; dark brown in color, rubbed off to sordid yellow in spots; characteristic markings of carapace faint; both extremities of carapace obtusely rounded and slightly serrate, upper surface distinctly three ridged with central carina prominent; plastron almost solid, very narrow posteriorly and weakly notched behind; uniform yellow in color. Head dark brown with obsolete black spots, no lines above or below eyes; snout tapering and conical; under jaw with longitudinal black stripes. Legs uniform black; feet broadly webbed; claws thin and sharp. Tail thick and suddenly acuminate at apex. The larger specimen measures as follows: Length of carapace $3\frac{5}{8}$ inches, width $2\frac{1}{2}$ inches; length of plastron, $2\frac{7}{8}$ inches, maximum width 2 inches; height of shell $1\frac{1}{2}$ inches; width of head $\frac{7}{8}$ inch.

No eggs or young of this turtle were collected and no data were secured as to its habits or life history.

5. **Chrysemys floridana** LeConte. Plate II, fig. 4; III, fig. 6.

This is probably the commonest turtle on the islands of the swamp. They were often seen on the sandy banks where they came to deposit their eggs, or found sunning themselves on the logs in the lakes and crossways or in the smaller cypress ponds on the islands. These turtles were active and hard to approach, unless taken with great caution from the rear, but were numerous and often observed. They were very common about the Lees' clearing, where not infrequently the eggs were plowed up, and were also found on Mixon's Hammock in a cleared sandy portion just west of a prominent Indian mound. About the Lees' clearing the dogs often discovered these turtles and by barking attracted the attention of members of the party. The dogs in the same way were constantly surprising the turtles on the hammocky edges of the island as the reptiles were returning to the water after laying their eggs. In endeavoring to arrest the progress of the turtles, the dogs usually had recourse to claws and teeth, and many of the specimens secured show deep

scratches on the shell which are no doubt evidences of such encounters.

Thirteen adults, four young and a large number of eggs were brought out of the swamp and numbers were collected which were not preserved. The month during which most of the specimens were taken (June) seemed to be the egg-laying season. The eggs, usually numbering from twelve to twenty, were found in the sand. One female killed for soup, June 4, 1912, contained sixteen eggs ready for depositing. A bear, killed May 30, had in its stomach twelve eggs, one of which was whole, and signs were plentiful to prove that the bears dug these eggs from the sand. When an egg complement was found exposed or only partly covered by the sand, or with the complement very small, the natives asserted that the turtle had been disturbed in the midst of egg-laying by the attack of bears or had been frightened from the eggs by these animals.[8] A king snake (*Ophibolus getulus getulus*, C. U., No. 6,147), captured June 26, 1912, had fourteen eggs in its stomach. Another king snake (C. U., No. 6,140), taken June 3, had thirteen eggs in its stomach. The stomachs of three other specimens of the same species of snake contained, respectively, one, two, and six eggs of *Chrysemys floridana*. It seems very likely that other snakes and perhaps other mammals, such as coons, find the eggs of this turtle a palatable article of diet. The eggs were also eaten by the Lees, and those eggs which were immature and secured before fertilization had taken place were pronounced by members of our party excellent eating; the older eggs seemed bitter.

The natives called this turtle the "cooter," and it was also locally known as the "hard-back cooter."

The specimens taken showed little variation in structure or markings. Most of those captured were females with decidedly convex plastron. The size of the shells of the mature specimens averaged about 1 foot in length by 11 inches in width and 5 inches in height. The largest specimen taken (No. 6,433) measured as follows: Length of carapace $13\frac{1}{2}$ inches, width 12 inches; length of plastron $11\frac{1}{2}$ inches, width $6\frac{1}{2}$ inches; height of shell $5\frac{1}{2}$ inches. The adult of *Chrysemys floridana*, as found in the Okefinokee, may be described as follows:

Carapace very high and dome-shaped; black-brown; vertebral plates smooth except anterior and posterior ones which are slightly wrinkled; costal plates with deep longitudinal wrinkles on upper

[8] In the middle of May, 1912, Mr. Harper reports that the edges of the canal were literally torn up by bears, coons, etc., which search for "cooter's" eggs.

three-fourths, lower fourth with transverse ridges; marginal plates smooth or lightly longitudinally rugose, the posterior sometimes slightly serrate at joints; vertebral plates marked with heavy longitudinal yellow line on each side of middle with fainter cross-lines of same color; costal plates with broad median yellow line extending outward, often bifurcate at distal end and sometimes surrounded with hieroglyphics of wavy lines of the same color; marginal plates with distinct median yellow band extending outward, rarely fainter bands on each side. Plastron uniform lemon-yellow, convex anteriorly, deeply notched posteriorly; edge of marginal plates with black spots beneath, varying in number, but usually five on each side. Head very small; eyes large; head and neck striped with yellow; median longitudinal bifurcated yellow-white line on underside of head, sometimes with white line inside bifurcation and yellow line on either side. Legs and feet deep brown-black marked with yellow stripes. Claws very long, the middle three of the anterior limb longest.

One specimen was taken in which the median stripe of the marginal plates was decorated on each side with a semicircular line followed by a short bar, thus agreeing with Holbrook's figure.[9]

The young specimens collected lacked the high, dome-like carapace of the adults. The shells were almost round and about $1\frac{1}{2}$ inches in diameter.

Description.—Carapace slate-colored, averaging three-fourths of an inch in height and abruptly keeled in the middle. Costal plates smooth with distinct median white line sometimes bordered by faint wavy lines of the same color. Marginal plates smooth, edges serrate at joints, decorated with median white line followed on each side by semicircular white line and white dot. Plastron clear light yellow. Under surface of marginal plates with line of black dots extending entirely around the shell. Middle three claws of anterior limb not very long, as in adults.

From the specimens examined it would appear that the young and immature forms are likely to show the markings of the carapace, the decorated marginal plates and the black spots of the under margin of the marginal plates more distinctly than the larger forms.

The eggs collected were uniform in size, shape and color. Shape ovate-elliptical, color pinkish-white, surface slightly granular, shells quite soft. Of 103 eggs measured, the average length proved to be

[9] North American Herpetology, Vol. I, p. 64, Pl. 8, 1842.

34.16 mm., and the average diameter 24.15 mm.; the mode 35 x 24 mm.; the maximum length 40.5 mm., and the maximum diameter 27 mm.; the minimum length 33 mm., and the minimum diameter 22 mm.

6. **Chrysemys reticulatus** Bosc.

Three specimens of *Chrysemys reticulatus* were secured in the Okefinokee, two on Billy's Island and one on Honey Island. The field notes of members of the party do not record any others as having been seen, and it is probable that this is one of the less common turtles of the swamp. The specimens secured agree with the published descriptions and there can be little doubt as to the identity of the species.

The largest specimen, which is probably most typical in all respects save the markings, may be described briefly as follows:

Carapace dull brown; thickly covered with fine reticulated grooves; each plate with a distinct flat marginal border; shell rather high, smooth in general outline; marginal plates with obsolete median yellow line; under side of each marginal plate with black spot, sometimes coalesced with that of the neighboring plate. Plastron smooth, reddish-yellow, median plates with a distinct tinge of red. Neck very long, skin loose, black. Head brown above with faint yellow markings; yellow beneath with distinct reticulated brown lines. Fore legs with wide yellow band in front, yellow below; feet black beneath; claws long. Under surface of hind legs and tail yellow; hind legs with alternate black and yellow lines posteriorly; tail with two black lines on under side. Measurements: Length of carapace $8\frac{1}{2}$ inches, width 7 inches; length of plastron $6\frac{3}{4}$ inches, width 4 inches; height of shell $3\frac{1}{2}$ inches; width of head $1\frac{1}{16}$ inches; interorbital space less than $\frac{1}{2}$ long diameter of the eye; orbits distinctly upwards and outwards in direction.

The second specimen differs from the first only in size, in having the carapace somewhat indented and in the darker colors and less conspicuous markings. In this specimen the lines on the under side of the head are more nearly parallel, and the yellow color less evident on the legs. The under side of the marginals would be wholly without black spots but for three very indistinct ones. The two spots on the bridge are widely separated.

The smallest of the three specimens was found on Honey Island and differs from the others only in the markings of the carapace and in the more brilliant colors of the body. The carapace of this specimen is smooth, without grooves, and beautifully decorated with

bright yellow, narrow reticulated lines covering the vertebral and costal plates; the marginal plates have a distinct median yellow band, in some instances this is connected with reticulate lines of vertebral and costal plates. The plastron is clear lemon-yellow with black band at extreme outer edge of abdominal and pectoral plates and on the axillary and inguinal plates. There is no variation in the pattern of the markings from that of the older and larger specimens, but the colors are much more evident.

No data were obtained as to the life history or the habits of this species.

7. **Terrapene carolina** Linn.

One specimen of *Terrapene carolina* was taken on Honey Island, June 2, 1912. The natives of the swamp call all box turtles "lock-ups," and report that they are comparatively numerous, but only two specimens were collected during the time our party was in the swamp, one *Terrapene carolina* and one *Terrapene major*.

The specimen of *Terrapene carolina* taken measured $6\frac{1}{2}$ inches in length, with a plastron (completely closed) $5\frac{1}{4}$ inches long; the total height of the shell $2\frac{7}{8}$ inches. Carapace dome-shaped, higher behind than in front, smooth as to general surface but with slight indentations on the middle vertebral plates; entirely covered with irregular dark yellow spots recalling Ditmar's comparison[10] of having been spotted with a brush. At the external margin of the costal plates a few irregular yellow lines extend outward. The shell shows no keel and the marginal plates are not flared. The edges of the marginal plates are yellow and the under side of the same plates marked with brown posteriorly. Plastron uniform yellow, interstices between plates brownish.

No eggs or young of this turtle were found and no data obtained as to its life history. The Lees stated that box turtles were very common in "The Pocket," but no opportunity offered for the investigation of this statement.

8. **Terrapene major** Agassiz.

One small specimen of *Terrapene major*, measuring $6\frac{1}{2}$ inches in length, was taken from "The Pocket" on June 29, 1912.

This species may be distinguished from *Terrapene carolina*, the only other box turtle taken in the swamp, by the flaring posterior marginal plates, the blunt keel behind, the bright yellow median

[10] The Reptile Book, p. 59.

line extending the entire length of the carapace, and the groups of radiating yellow lines marking the costal plates.

The carapace is chocolate-brown in color with characteristic radiating yellow lines on the upper surface of the costal plates and subparallel yellow bands extending outward on the external margins; each plate is marked with regular concentric subrectangular grooves. Plastron (closed) $5\frac{3}{8}$ inches in length and $3\frac{1}{8}$ inches in width; uniform yellow in color with a reddish-brown spot on the external posterior angle of each plate; all plates showing parallel grooves along the median line, and in the case of the abdominal plates these grooves make a right angle at the median anterior corner of the plate and extend laterad reaching the margin. Under side of marginal plates yellow with irregular markings of brown.

In the one specimen taken, the posterior end of the shell is somewhat mutilated.

9. **Platypeltis ferox** Schweigger. Plate I, figs. 1, 2, 24; II, fig. 6.

This species is common throughout the swamp. Adults, young and eggs were collected, and the field notes show that this turtle was recorded from Billy's Island, Honey Island, Floyd's Island, Mixon's Hammock, Billy's Lake, Minne Lake and Sweet Water. This species is doubtless to be found in all parts of the Okefinokee, and is especially abundant in those places where the water is deep and the bottom soft. The natives claim that soft-shelled turtles are to be found wherever there are alligators, and this fact seems to be borne out by the observations made on these turtles. On May 31, 1912, an attempt was made to seine a "'gator hole" on the Honey Island Prairies. Before seining, Bryant Lee went over the hole "grunting," a method locally used to start the alligators, which animals, it is claimed, will respond to this peculiar vocal accomplishment and show their presence by rows of bubbles on the surface by which they may be followed. In this instance the supposed alligator was pursued for some distance, only to prove to be a large *Platypeltis*. It is not improbable that the deep, secluded "'gator holes" may furnish a favored retreat for this turtle whose ability to defend itself by its powerful mandibles and snake-like bite is well known and may be sufficient protection against the alligator itself. According to the Lees, this turtle is very active and can use its legs to a remarkable degree, especially while in the water, and plenty of evidence was secured to show that its legs and knife-edged beak were no mean weapons. A captured specimen, a foot or more in length, which was kept around the camp for several days, showed a sur-

prising ability to dig through the sand and could jump forward practically its own length.

On account of the size and weight of this turtle, it was impracticable to carry a large series out of the Okefinokee with the limited means of conveyence afforded to the expedition, but sufficient data were secured from the large number of specimens observed to give a fairly accurate account of their appearance, habits and life history. A number of heads, skulls, carapaces, young turtles and eggs, both mature and embryonic, were collected and brought out of the swamp, and notes were made on the adults in their native environment.

The adult turtle may be described as follows from an average specimen taken June 12, 1912, on Billy's Island, and preserved as C. U., No. 6,471.

Carapace chocolate-colored with obsolete irregular patches of black; strongly tuberculate at anterior end, with faint, subparallel, longitudinal rows of tubercles extending the entire length of the vertebral and costal regions of the carapace and becoming more prominent and pronounced at the posterior end; marginal area soft and flabby, especially at posterior half. Plastron smooth, yellowish-white, extending well forward and somewhat exceeding the carapace, almost entirely covering the fleshy parts anteriorly, narrower behind and leaving much of the posterior part of the body exposed. Head comparatively small, smooth, brown, markings very faint; snout developed into a long fleshy proboscis; lips fleshy. Tail thick; vent close to end; extremity of tail suddenly acuminate beyond vent. Measurements: Carapace $15\frac{1}{2}$ inches long, 11 inches wide; plastron $11\frac{1}{2}$ inches long, 10 inches wide; height of shell 5 inches; width of head $2\frac{1}{2}$ inches.

The heads were cut off from some of the larger specimens and preserved when it was impossible to carry the entire turtle.

Such a head, representing one of the largest of the turtles captured (No. 6,473), measures $3\frac{1}{2}$ inches in maximum width, 2 inches in height, $\frac{1}{2}$ inch between eyes, 3 inches from snout to angle of mandible, and shows a proboscis $\frac{1}{2}$ inch in length. The head is brown above, with white on snout, below the eyes and at edges of mandibles, and yellowish-white on the entire under side. The eyes are small and, as will be noticed from the measurements, near together. The head is strongly tapering and the opening of the mouth well inferior. The lips are fleshy with loose skin and the jaws large and strong. This head was from a large female taken June 22, 1912, which contained 49 embryonic eggs in an advanced stage of development.

The complete skull of a soft-shelled turtle, with cartilages of mandibles still attached, was found on Billy's Island, June 19, 1912. This skull agrees with Boulenger's short description[11] and in all general features with Hegner's figure,[12] and, while much weathered, shows the bones and sutures in excellent shape. It is remarkable for the high supraoccipital ridge (the two squamosal ridges being damaged) and for the very flat temporal region.

This skull measures $3\frac{3}{4}$ inches in length, $2\frac{1}{2}$ inches in width, $\frac{1}{4}$ inch between eyes, diameter of sockets $\frac{5}{8}$ inch, distance from orbital to nasal opening $\frac{3}{8}$ inch, length of lower mandible $2\frac{1}{2}$ inches, width of lower mandible at posterior angle $2\frac{1}{4}$ inches, height of lower mandible at middle $\frac{1}{2}$ inch, distance between orbit and auditory cavity $\frac{3}{8}$ inch, distance from orbit to margin of upper mandible $\frac{1}{2}$ inch, maximum height of head, including both mandibles, $1\frac{3}{4}$ inches.

Several carapaces of *Platypeltis ferox*, much weathered and usually more or less mutilated at the edges, were found on Billy's Island.

Such a carapace shows the upper surface white and finely reticulate, with pits prominent and the sutures distinct. Nine neural plates are present, the anterior very broad and without corresponding costals on either side (*i.e.*, is a nuchal); in form rectangular, about twice as long as wide. Seven costal plates on each side, parallel and regular, and extending transversely across the carapace. The marginal area appears brown and leathery, the plates fused. The under surface of the carapace is smooth and yellow-white. The ribs are prominent and imbedded in the plates of the carapace; eight on each side, extending more or less radiately from the vertebral column. This column is likewise fused with the carapace and presents nine vertebræ. One carapace with nine neural plates had eight, not seven, pairs of costal plates, the last two pairs meeting on the median line where the neurals are absent. These carapaces are about 9 inches in length, 8 inches in breadth and 2 inches in height.

A good series of young soft-shelled turtles were collected in the swamp and preserved. These range in size from $1\frac{5}{8}$ to $3\frac{1}{8}$ inches in length and show plainly the brilliant, characteristic markings of the carapace, especially when the shells are wet. The smallest specimens agree well with Ditmar's figure.[13]

The carapace is gray-black, strongly marked with irregularly

[11] Brit. Mus. Cat., p. 259.
[12] College Zoology, p. 530, fig. 440—from Zittel.
[13] Reptile Book, p. 76, Pl. 26.

placed round black spots. Vertebral and costal regions finely, longitudinally rugose with broken lines of linear tubercles; anterior tubercles very small. The marginal area smooth, brown and broadly edged with white. Plastron soft, slate-colored, a white spot on each side of the median line; plastron extends far forward, exceeding the carapace anteriorly, short behind, leaving posterior fleshy parts exposed. Head, neck and under parts of body black. Neck long, skin loose and much wrinkled. Snout long, white beneath, white spot at base of snout with white line from this spot to each eye, and white line at edge of mandibles.

As the specimens become older, the gayly colored markings of the carapace become less distinct and have disappeared on turtles which have attained a length of 6 inches. The anterior tubercles of the shell become better developed and the whole carapace rougher. The plastron grows lighter in color and the head uniformly darker, with the markings obsolete. A small specimen of a young soft-shelled turtle was found in the stomach of a water moccasin (*Ancistrodon piscivorus,* No. 6,214) taken late in the summer. Very likely, while in this soft-shelled, fleshy state, these turtles furnish an acceptable addition to the food of the larger snakes and perhaps to other animals of the swamp.

Eggs of *Platypeltis ferox* were easily secured. They were usually found in the sandy fields and occasionally the turtles were captured at the places of oviposition. The eggs were generally deposited in two or three inches of sand in some place where the surface of the earth was warmed by the direct rays of the sun. One complement of twenty-two eggs was discovered, June 26, on Floyd's Island in which the eggs were uncovered. This was probably due, however, to the fact that the turtle had been in some manner frightened before the egg-laying process was completed. The eggs are almost exactly spherical, averaging 31 mm. in diameter, almost white, somewhat brittle, surface slightly granular and shells very thin. A number of complements of embryonic eggs at various stages of development were taken from turtles and brought out for study. These eggs are bright orange colored, becoming lighter as they mature, and are practically spherical. They vary in size from 15 mm. to 32 mm. in diameter, with soft, indented skins, smooth and fragile. In one specimen of *Platypeltis* (No. 6,484) were found twenty eggs graduating from very small bright orange ovules to one fully developed white egg 31 mm. in diameter, seemingly ready for depositing.

According to the data secured, it would appear that the egg-laying season for this turtle is represented by the months of June and July. The young turtles feed on fish and frogs, and according to the natives the larger specimens devour also such water fowl as are unfortunate enough to be taken unaware by these reptiles. They frequent the deepest parts of the streams and lakes, but come out to the sandy portions of the islands to deposit their eggs. They are vicious, active, and are among the largest of the Reptilia of the Okefinokee.

LACERTILIA.

10. **Anolis carolinensis** Cuvier.

Common throughout the higher portions of the swamp. Most common on the islands, but seen also on bushes in the swamp proper. Recorded on Billy's Island, Gallberry Island, "The Pocket," Honey Island, Mixon's Hammock, Minne Lake Islands, in the crossway between Billy's Island and Gallberry Island and on the trail from Billy's Island to Minne Lake Islands. Found chiefly on large bushes and small deciduous trees, where it dodged around the limbs at the approach of the collector. This species is quite active and adept at climbing.

The Okefinokee specimens are practically uniform in size and structure. Several of the specimens had suffered the loss of part of the tail, but the measurements of body parts showed little variation. The average length of the body to vent was 50 mm., and of the tail about 90 mm. In life the usual color of the dorsal surface of the body and tail was light green; the ventral surface almost white, except the belly, which was blue or bluish. The alcoholic specimens show the dorsal colors ranging from slate-gray to dark blue-green, with the ventral surface of the head, throat, and breast showing shades of pink with minute dark spots in longitudinal rows, and the throat often having a loose reddish fold. The belly ranges through various shades of gray and blue, with the vent and under surface of the hind legs lighter. The tail is uniformly blue-green below.

The scale and plate arrangement proved to be practically constant. The dorsal head ridges in the smaller specimens were sometimes more or less indistinct, but generally showed 11 to 15 plates. The *canthus rostralis* uniformly consisted of six plates; the upper labials of 10 to 12; the lower labials of 11 to 13.

The nostrils appear on a line between the first and second superior labials and above the *canthus rostralis*. The latter is always well

developed and prominent. The rostral plate is very broad. The lower jaw has no median symphyseal plate, the first infralabials of the two sides meeting on the median line.

No data were secured which would give any information regarding the breeding habits of the species in the swamp.

On December 22, 1914, Dr. Bradley found a small, shriveled specimen of *Anolis carolinensis* in a pitcher plant. From a botanical standpoint, it would be interesting to know whether this plant is able to capture forms as large as this lizard.

Incidently it may be noted that this was the only lizard seen by Dr. Bradley on this trip, and it would appear that the lizards are not commonly out at this season of the year.

11. **Sceloporus undulatus** Latrielle. Figs. 1, 2.

Abundant throughout the higher and drier portion of the Okefinokee and called by the natives "scaly lizard." Most common on the sandy pine lands, where they seem to prefer the fallen timber, logs and stumps, and always to be found around fences and piles of cut wood. Very active and, like many of the other lizards, difficult to secure without the loss of some portion of the tail.

The specimens taken proved to be fairly uniform in size, the largest measuring 155 mm. in total length and the smallest 122 mm. In the comparative measurements the figures show a pronounced agreement. The length to vent is slightly less than one-half the total length; the length of the fore leg almost exactly equal to the distance from the anterior end of the head to the axilla; the hind foot about one-half the length of the hind leg, and the width of the head about equal to the length of the fore foot.

The colors are somewhat variable. The dorsal surface is usually grayish-black, sometimes a brilliant black. The undulating cross-bands are often very faint or obsolete; when distinct they are generally 10 or 11 in number with the white markings prominent. The ventral surface of the body is yellowish-white with numerous dark spots in more or less regular rows. Down the median ventral line these spots run together to form a longitudinal stripe, which in all of the specimens from the swamp is quite prominent. Superimposed on the spotted gray-white body color may be found patches of black or blue, the latter usually on the throat and sides of the belly. Occasionally the throat shows on each side a brilliant light blue. In a few specimens the ventral surface of the head and belly appears brilliant black. The breast and pelvic region is almost invariably sordid yellow-white with the characteristic dark spots.

The femoral pores are always present, ranging in number from thirteen to fifteen, and sometimes very prominent on the summit of a high ridge.

The plates of the head are clearly defined and easily distinguished, but in some regions most irregular and complicated in arrangement. The specimens usually show five supraorbitals (in three cases six) separated from the median plates of the head by a single row of small scales and bordered externally by two or three rows of superciliaries. The usual arrangement of these superciliaries is in two irregular rows with occasionally one or two plates of a third row. The labial plates appear very uniform, the superior row containing five plates and the inferior six. In one or two of the larger specimens this was increased to 6–7.

The plates of the median dorsal region of the head, however, present a most interesting variation. It is of interest to note that no two of the specimens taken were alike as to the number and arrangement of the plates of this region, although all were collected in the same locality within a period of one month. A discussion of these plates is rendered difficult by the fact that the descriptions by various authors differ widely in terminology, and it is not easy to determine upon consistent names for the series of plates which may be found. The occipital is large and polygonal and sometimes subdivided (Nos. 6,408, 6,414, 6,415). It contains the pineal eye, which is always present. This plate is bordered by a row of smaller plates ranging in number from four to seven (cf. Nos. 6,413, 6,417 and 6,418). Anterior to the occipital in a small single plate, sometimes adjacent (No. 6,410) and sometimes separated by the two anterior plates of the bordering row (No. 6,411). The next plate anteriorly is a large pentagonal or hexagonal plate slightly anterior to the middle of the eye. The next row may consist of two or of three plates. If of three, the middle one is small (cf. Nos. 6,402, 6,406 and 6,413). The next plate is large and may be subdivided to form an irregular transverse row. The single condition is shown in Nos. 6,405, 6,406, 6,407, 6,414 and 6,415; the subdivided condition in Nos. 6,409 and 6,412. Anterior to this plate, and between it and the internasals, there may or may not appear a row of plates (when present usually three), more or less regular and usually pentagonal. This row is shown in Nos. 6,405, 6,406, 6,407, 6,415, 6,417 and 6,418. The two internasals are comparatively large, very irregular in shape and seldom bilaterally symmetrical. They are almost directly above the nostrils. They may be subdivided (No. 6,410),

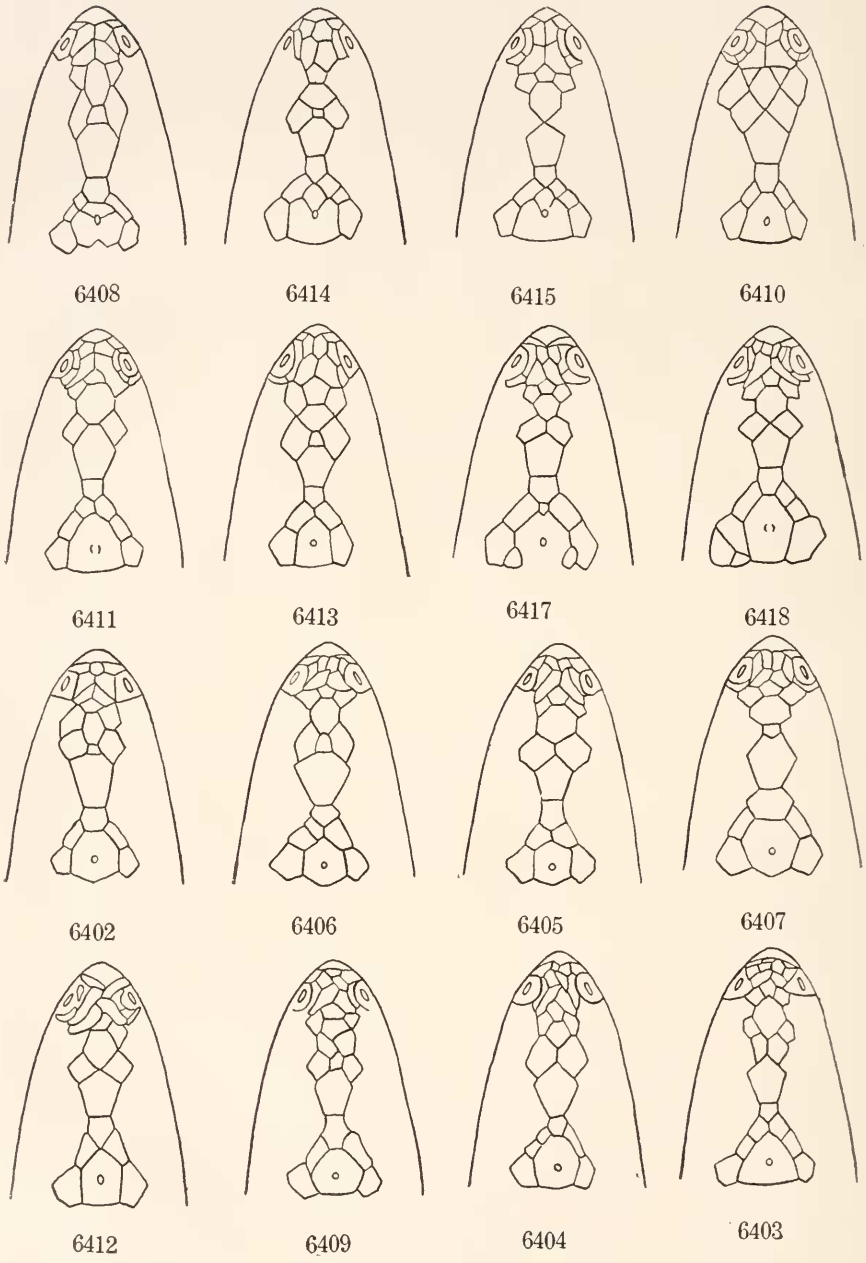

Fig. 1.—*Sceloporus undulatus* Latr. Plates of the head.

or one may be subdivided and the other not (Nos. 6,408 and 6,411). Between the internasals and the rostrum appear two plates, usually unsymmetrical, and apparently twisted out of position. Their longest diameter may be transverse (No. 6,412) or longitudinal (No. 6,413), and there is sometimes found a third plate in the row (No. 6,409).

In spite of the fact, however, that all of these median plates of the head may be so irregular, so twisted from a bilateral condition,

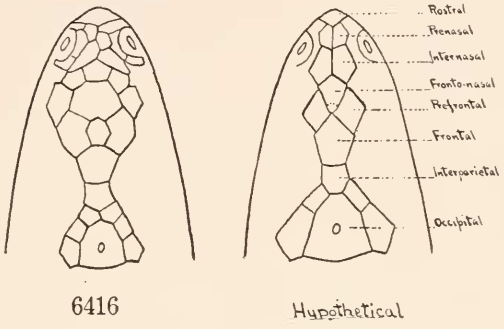

Fig. 2.—*Sceloporus undulatus* Latr. Plates of the head.

so confusing in arrangement, and so liable to subdivision, it might be pointed out that the *series* of rows is comparatively uniform. The hypothetical arrangement of the most simple condition might be represented by the figure (fig. 2), and from this arrangement all of the variations shown could be developed. Whether such a simple arrangement would represent the most generalized form or not would be a matter of conjecture.

12. **Ophisaurus ventralis** Linn. Fig. 3.

Three specimens of *Ophisaurus ventralis* were taken in the Okefinokee. The Lees, however, report that this lizard is not uncommon and call it the "grass snake," giving as an explanation of the name the fact that they have noticed that its locomotion appeared difficult except in grassy places. They apply the name "joint snake" to an entirely different reptile, which they describe as having joints around the body and which may be *Rhineura floridana*, although no specimens were seen of this form. The three specimens collected were taken in the grass on Billy's Island, but no data were secured as to their life history or habits.

The two smallest specimens are quite different from the third and largest and may be discussed first. These specimens measured,

respectively, 590 mm. and 355 mm. in length, the chief difference being in the length of the tails. The longer of the two measured 162 mm. to vent and the smaller 127 mm., while the distances from tip of rostrum to eye and to ear in both specimens were identical. The head of the longer specimen was $1\frac{1}{2}$ mm. broader than that of the other. The two specimens agreed in scalation and in color. The dorsal surface was light, rather cinnamon-brown, with three very dark brown longitudinal stripes, two lateral and one dorsal, the dorsal being slightly fainter than the lateral. The sides of the head and of the anterior part of the body appear spotted; the entire ventral surface of body and tail uniform lemon-yellow. The dorsal rows of scales, of which there are sixteen, are separated from the ten ventral rows by a distinct groove. The preanal scales are slightly larger than the abdominal. The dorsal scales of the body are carinate and are wider than long. The color and stripes therefore agree with Cope's description of variation "11. J."[14]

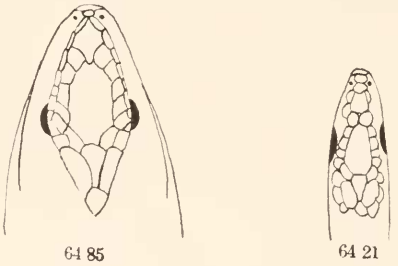

Fig. 3.—*Ophisaurus ventralis* Linn.

The plates of the head show the interfrontonasals separated from the frontal by the two prefrontals which are in contact on the median line and thus agree with Cope's "I. C.,"[15] but in addition show *two* interfrontonasals, one anterior to the other, as in the subspecies *compressus* (*Ophisaurus ventralis compressus* Cope). These specimens also agree with *compressus* in having but two rows of plates between the labials and the canthal row; in having two large superior labials touching the orbit below, and in having the caudal plates at the extremity of the tail longer than wide—characters which are given as peculiar to *compressus*. The coloration, however, does not agree with that given for *compressus*, and the body does not

[14] Rep. U. S. Nat. Mus., 1898, p. 497.
[15] *Loc. cit.*, p. 496.

show in the least the typical compression which distinguishes that subspecies. In coloration these two specimens apparently agree with *U. S. Nat. Mus. Cat.*, No. 10,584, which Cope said restrained him "from regarding the form *compressus* as a distinct species." It is, nevertheless, interesting to note the gradation, since it makes these forms from the swamp seem to stand between the typical *ventralis* and its unique subspecies, the standing of which may be subject to question.

The largest of the three specimens is quite distinct in color and form, although found in exactly the same locality, and may be briefly characterized as follows:

Body very stout and thick; dark brown above with many small white spots irregularly placed on the head, and in more or less regular longitudinal and transverse rows or lines on the dorsal surface of the body and tail, giving the whole a checkered appearance. The stripes are obsolete. Under surface of body sordid yellow-white; the tail clear lemon-yellow beneath. There is but one interfronto-nasal, and the superior labials do not touch the orbit. Superior labials ten in number. Length 525 mm., maximum width 20 mm., length to vent 265 mm.

13. **Cnemidophorus sexlineatus** Linn. Plate II, fig. 2.

Apparently common throughout the islands of the swamp. Certainly one of the most common lizards on Billy's Island. Also numerous on Honey Island and Minne Lake Islands. This lizard, in spite of its swiftness, was easier to secure in the field than the other common species on account of the fact that it did not possess the disconcerting habit of dashing along fences and through the underbrush.

It is locally known as the "race-nag," a name which, like many of the other names used by the inhabitants of the swamp, was strikingly descriptive, since the lizard is so remarkably active and scurries over the ground with surprising speed when disturbed. It appeared most abundantly in the plowed fields where the Lees had planted corn, peas and goobers, and since these plowed fields are very sandy, the common name of "sand lizard or swift" is quite appropriate. They were commonly seen among the "goober" vines where their colors blended well with the lights and shadows under the leaves. These lizards seemed to prefer the bare furrows for sunning themselves, and in the raised earth between the furrows had dug their holes, into which they darted when disturbed. These burrows extended in irregular directions to a depth of 8 or 10 inches,

which made the digging up of the lizards a comparatively easy task. Between the plowed furrows, also, in holes from 4 to 12 inches deep, were deposited the eggs, usually four or five together. The eggs were about 16 mm. in length by 10 mm. in greatest diameter, ellipsoidal, comparatively soft, semitranslucent, and almost salmon-colored; not smooth or shining, but slightly rough and subpubescent.

Little data were secured on the life history or the breeding habits, but from the fact that eggs were secured at this time—June—and also the fact that several of the specimens taken showed the blue abdomen characteristic of the breeding male, it is evident that this month represents at least a part of the breeding and egg-laying season. Since, moreover, the reptilian developmental period is comparatively long, the bulk of ovulation must have been practically over, or some of the females taken would have been found with eggs, which was not the case. Specimens of *C. sexlineatus* were found in the stomachs of two blacksnakes (*Zamenis constrictor constrictor*, C. U., Nos. 6,157 and 6,155), a fact which shows that this species of lizard, like many others, shares the fate of providing food for the larger reptiles of the swamp.

The variations of the specimens taken are especially interesting from the fact that all those described are from one locality and were all taken within a period of approximately a month, so that the variations cannot be explained by season or habitat.

A number of striking differences may be observed in the Okefinokee forms as compared with Cope's description and figure,[16] which were used as a basis for study. It should be noted that the figure shown by this author (p. 594) does not agree with the description (pp. 594–596). This is particularly true in the discussion of the head and anal regions. For example, the figure (cf. Cat. No. 4,878, U. S. N. M.) shows a small plate between the frontoparietals, while no mention is made of such a structure in the text; the figure shows seven supralabial plates, while the text notes five; four anal plates are figured, while the description states that three is the correct number. On the whole, the specimens examined conform much more closely to the text of Cope than to his figure.

The following variations are to be found in the Okefinokee specimens, these variations being chiefly in scale and plate arrangement rather than in size or comparative measurements, although none were collected in the swamp which were as long as 235 mm., the

[16] Rept. U. S. Nat. Museum, 1898, pp. 593–598.

length of No. 9,256, U. S. N. M., which is given by Cope as typical. A table of measurements of various parts of the body shows a close agreement in the relative sizes of body parts. The plates of the head agree fairly well in number, but differ greatly in size and shape. One of the most variable of the plates is the first supraorbital, which may be entire, cleft, parted or completely divided, cutting off a small caudolateral portion as a separate plate. The frontoparietals are usually subequal to the parietals, but are sometimes smaller, seldom larger. The frontal is usually pentagonal in shape, but the surface varies from a deeply three-ridged condition, which is the most common, through an obsoletely three-ridged surface to one practically flat or slightly convex. The interparietal plate is sometimes bifid, sometimes flat, but oftenest high at the centre and at the edge, with a submarginal depression or moat which is well defined. Posterior to the parietals and interparietal the plates are most irregular and variable. In some specimens one or two distinct rows of plates are found in this region, with from five to eight plates in a row; in others only one well-defined row is present, and this is often interspaced with very small plates or scales; more often all of the plates of this region are small and indefinite in arrangement. The superciliaries of the orbit vary from three to six, the usual number appearing to be five. Of these the anterior two are carinate and the others are convex or flat. The inferior orbitals range from three to five, the anterior and posterior being usually small. The superior labials are generally five in number; one specimen examined showed seven, two had six, and one, four. One of the most constant of the characters of the species seemed to be the femoral pores, of which fifteen were found in the most typical specimens, the range being from thirteen to seventeen, but other numbers than fifteen appearing very rarely. The anal plates, on the other hand, were decidedly variable. In the majority of cases these plates agree with Cope's description: "three large scales, placed in a triangle, two posterior to the other and with smaller scales behind." This arrangement seems to be typical, but even in the comparatively small series from the Okefinokee one specimen was found with only one anal plate, four with two—one posterior to the other—one with three in a longitudinal row, and several showed a wide granular space between the plates and the vent. In other regions the plates are quite uniform and agree well with the arrangements noted by Cope.

The color is quite constant and the stripes persist through life, never becoming obsolete. A faint brownish band, sometimes

double, is often found extending down the median dorsal line of the body. The scales of the fore leg, hind leg and thighs are practically without variation in the specimens studied.

It might be noted that in many of the specimens recorded from the Okefinokee the plate arrangement agrees much more nearly with the figure and description of *Cnemidophorus septemvitattus* Cope than with *C. sexlineatus*. This is noticeably true of the anal plates, the general head structure and, in some cases, the femoral pores. In fact, if the median dorsal longitudinal line which sometimes appears were more distinct, some of these specimens would seem to merge into the typical *septemvitattus*. None of these specimens, however, are as large as the type of *septemvitattus* (No. 2,872, U. S. N. M.), nor do any show the colors of the unique specimen of Cope's species, which appears quite distinct, resembling western forms in general appearance and coloration, although the locality given for the type specimen is denied by Van Denburgh,[17] and the species does not seem to be as firmly established as might be wished.

14. **Lygosoma laterale** (Say).

Not common. Only eight were taken in the swamp and but a few others were seen. Of the eight specimens collected, one was found under the bark of a log, one at the edge of a small stream, almost in the water, one under leaves in the woods, and the rest on the ground in open places. This species seemed comparatively slow of movement and was not particularly difficult to capture.

The specimens showed no peculiarities of markings or of plate arrangement. The colors of the alcoholic specimens seemed to be more or less obscured, but the dorsal surface usually retained the characteristic bronze sheen, and the lateral stripes, although somewhat faded, were distinct. The ventral surface of the head and pectoral region was normally yellowish-white, the throat and vent lighter, the belly and under side of tail blue. The following note taken of a living specimen in the field gives, perhaps, the most accurate color description:

Six rows ventral scales yellow from vent to fore limbs; chin and gular region pinkish-white; a row of yellow scales above yellow ventral rows on either side; then five rows of dark-edged grayish scales followed by a lateral black stripe; seven rows of reddish-brown scales across the back. Reddish-brown of back marked off from black lateral stripe by a thin reddish line.

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[17] Occasional papers. V. Cal. Acad. of Sciences, 1897, p. 133, note.

The specimens were remarkably uniform in both comparative and in actual measurements, the differences being chiefly in general body and tail lengths, rather than in variation in size of limbs or in distances between fixed points.

In the discussion of the plates and scales of this species it should be noted that Cope's description[18] is most unsatisfactory, the terminology being confused, if not actually inaccurate.

The description given by G. A. Boulenger in his *Cat. Lizards Brit. Mus.*, 1887, Vol. III, p. 263, proved the most useful and accurate.

In the Okefinokee specimens the dorsal plates of the head are absolutely uniform and may be described as follows:

Rostral short; internasal pentagonal; nostrils piercing nasals; no supranasals; frontal in contact anteriorly with internasal, and two prefrontals widely separated posteriorly from interparietal by two broad frontoparietals; interparietal kite-shaped, much longer than wide; parietals 2; supraorbitals 4; superciliaries 7; superior labials 7.

Little data were obtainable regarding the life history of *Lygosoma laterale*. No eggs were found.

15. **Plestiodon quinquelineatus** Linn. Fig. 4.

Common throughout the higher portions of the swamp and on the islands. Seemed to be particularly fond of deserted buildings and chimneys where any such structures occurred, and often found along fences. The larger forms were called by the local names of "red-headed scorpion" and "red-headed lizard," while the smaller striped forms seemed to have no common local name, being probably confused by the natives with *Cnemidophorus sexlineatus* Linn. *Plestiodon quinquelineatus* was seldom seen on the ground or on the trees, but was often found stretched out in the sun on dead logs, stumps or fallen timber.

Although this was one of the most common of the lizards noticed in the Okefinokee, comparatively few specimens were collected on account of the fact that their habits made it a difficult matter to secure them, since they dashed into crevices and holes or darted along the fences or into the brush on the least provocation. They were abundant in the deserted log buildings on Billy's Island and were seen in large numbers in and around the old, abandoned house on Mixon's Hammock, where they scurried over the ruined floor and over the decayed timbers of the walls, only to dart into the cracks

[18] Rept. U. S. Nat. Museum, 1898, p. 622.

at the approach of the collector. In fact, had the object been the securing of "tails" rather than lizards, the collecting would have been far more successful, since the small blue-tailed form, particularly, was prone to leave a tail wriggling in the collector's hand while its owner scurried to safety.

Enough specimens were collected, however, to show practically all of the stages usually recorded, from the small, black, brilliantly-marked form with the clearly bifurcated median stripe to the large, brown, red-headed stage with the plain brownish coloration, broad head and obsolete bands:

The specimens naturally varied much in size as well as in coloration, the smallest taken being 92 mm. long while the largest measured 237 mm. The coloration of the ventral surface of the body and head seemed to vary according to the colors shown by the dorsal region. For example, in the distinctly five-lined form, in which the dorsal

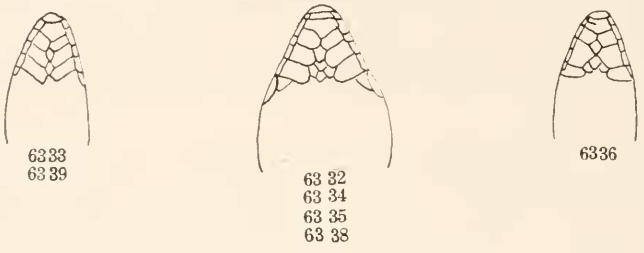

Fig. 4.—*Plestiodon quinquelineatus* Linn.

surface was nearly black, the ventral surface of the head and throat was usually tinged or mottled with blue, while in the older brown specimens with the brown dorsum and red head, the sides of the head generally showed a tinge of orange and the white of the under surface was permeated with red or yellow rather than with blue. The belly in both forms was usually bluish, with the plates around the vent approaching white. Although the size varied considerably, the relative length of the body parts was remarkably constant, except in the width of the head, which is of course unusually broad in the older males.

The scale and plate arrangement of the Okefinokee specimens varied but little. The supraorbitals usually showed six plates; the superior marginal plates of the orbit nine, of which the middle three or four were often very narrow; the superior labials seven or eight, the most posterior being the largest. All of the specimens but one, however, showed two large distinct occipital plates, rather

than the irregular arrangement figured by Cope.[19] One specimen—the largest—agreed with Cope's specimen (No. 9,234, U. S. N. M.) in this respect. A variation was also noted in the plates of the mental region. Cope's figure (*ibid.*) shows two unpaired plates posterior to the mental. Of the specimens taken in the swamp, just half of the number collected conformed to this arrangement, while the other half showed only one unpaired plate between the mental and the first pair of inferior labials.

It can hardly escape the notice of the herpetologist that these peculiarities (the single postmental plate and the two occipital plates) here noted as variations of *P. quinquelineatus* are, except for the postnasal, among the chief structural characters usually given for the species *P. anthracinus* Baird, and the single or double postmental enters into Cope's four main divisions of the genus. Normally, one would expect two postmentals in *P. quinquelineatus*, and it so proves by examination of a large series of extra-Okefinokee specimens from other parts of southeastern United States, but this single postmental in the Okefinokee specimens is not limited to small forms, as are most of the supposed species with single postmentals. The largest red-headed specimen (No. 6,339) has this character, and another good-sized individual has only one postmental, but there is on one side of this plate the merest beginning of a suture to suggest where the subdivision might come if it were to be. We suppose Cope would be obliged to make these "postnasal—one postmental" specimens members of his first division, in which he places his Bermudan species, *E. longirostris*, but we could hardly grant such a solution, and this restricted collection of Okefinokee skinks prompts a doubt of the actual rank of *E. longirostris* and possibly of *E. anthracinus* and *E. pluvialis*, or, in other words, we have our specimens referable to two of Cope's four main groups for the genus, and if the postnasal character be proven variable this *P. quinquelineatus* may yet offer variants referable to the other two divisions. Certainly, the status of the species of *Plestiodon* is in a most unsatisfactory state at the present time.

The species *P. quinquelineatus* ranges through a wide series of coloration during life, particularly as pertains to the stripes and markings. The same bands appear in some specimens as are found in *P. anthracinus*, with a difference only in colors and brilliancy. Since the structural plate characters overlap, as has been noted

[19] Rept. U. S. Nat. Mus., 1898, p. 634, fig. 125.

above, the suggestion can hardly be avoided that if environment and climate be considered as affecting markings, it may lead to a reconsideration of the value of such a basis for specific distinctions.

An interesting illustration of regeneration was found in one of the specimens taken (No. 6,339) in which the tail had been injured 75 mm. from the vent and a new tail 65 mm. long regenerated. The old tail, however, still persisted, and projected at almost right angles to a distance of 10 mm. with a small shriveled stump on the end suggestive of a spine or barb.

Several of the specimens of *Plestiodon quinquelineatus* were infested with red mites (*Acarina*), which appeared attached under the fore legs. One individual had eight of these parasites under one fore leg and twelve under the other.

Crocodilia.

16. **Alligator mississippiensis** Daudin. Plate II, fig. 1.

The alligator was found to be extremely common throughout the Okefinokee, and after the novelty of watching their interesting habits had worn off, no particular attention was paid to them by members of the party. Alligators were constantly being seen in all parts of the swamp, and a short trip in any direction from Billy's Island usually resulted in the noting of several specimens. Outside of a few shot for their skins and those killed for food, no adults were collected, as it would have been entirely impracticable to have transported their heavy bodies out of the swamp. A number of young were taken, and of these a half dozen or more were preserved.

A trip down Billy's Lake, from Billy's Island to Mixon's Hammock, was always the occasion for more or less sport in endeavoring to approach the alligators as they lay on the banks, in following their courses as they swam across the placid stretch of water, leaving broad ripples in their wake, or in listening to the interesting vocal gymnastics of the Lees as they endeavored by "grunting" to induce a specimen to rise to the surface. The reptiles were often seen sunning themselves in the rank masses of vegetation, which lined the shores and were not infrequently surprised at very close quarters while they were swimming.

Whoever has heard the bellowing of "gators" on Big Water or on Floyd's Island Prairie will ever remember it as one of his most distinct memories of the swamp and need ask for little else more blood stirring or thrilling upon first acquaintance. The Lees claim the young ones can bellow nearly as loud as the older ones and that they

distinguish them by the intervals, which are much shorter in the younger ones. Mr. Harper saw a five-foot alligator at the north edge of the swamp with his jaws tied with a cord which for several days it could not break. Later he observed that Bryant Lee could hold shut the two jaws of a wounded "gator."

Since these animals were found in every part of the swamp, no mention of particular localities is of importance. They were most abundant, perhaps, in Billy's Lake, in Floyd's Island and Honey Island Prairies and in the head waters of the Suwanee River. "'Gator holes," however, were to be seen in all waters deep enough to afford seclusion for the animals. These holes ranged in size from a few feet across to large areas extending from 25 to 75 yards in diameter. Throughout the swamp and in the prairies, also, were long open tracts in which no water-lilies grew, and these were pronounced by the natives to be "'gator trails."

The methods of hunting the alligator, as practised by the Lees and other inhabitants of the region, consist mainly of going out at night in small boats and locating the animals by means of a lamp fastened to the head of one hunter in the bow of the boat. Another hunter in the stern paddles or poles and uses the sharp end of the push pole to "stick" the body after the animal has been shot and has sunk to the bottom. According to these hunters, who every year take out a large number of skins, the eyes of the small alligators appear red by the light thus used, while those of the large specimens are yellow. The hunter carrying the light swings his head from side to side through an arc of 180 degrees, and when an alligator is sighted shoots it by the light of the lamp on his head. The common supposition that the skin of an alligator will turn the bullet of a gun is, of course, unfounded. Since, however, only the head of the animal is usually exposed when it is in the water, they are commonly shot through the eyes. The hunters generally use a shotgun loaded with buckshot. That a large number of alligators are annually secured in this manner is evidenced by the fact that the fields of the Lees are strewn with the skeletons and dorsal strips of skin which have been thrown away after each expedition. Only the ventral part of the skin is saved, the upper portions being too thick and spiny to admit of the primitive methods of tanning, and therefore the crest and dorsal scales are not retained.

Plenty of evidence was secured to prove that the alligator is a formidable antagonist when in the water. The powerful tail is the chief weapon of defence, and with it the animal can deal a terrific

blow. On June 13, 1912, a large-sized alligator was seen to slowly sink below the surface as several members of the party in a small boat were making a trip on Minne Lake. Bryant Lee "grunted" the animal to the surface, where it was shot, but not killed. It rose within a foot or two of the boat and performed a most remarkable series of spinning movements, revolving rapidly on its tail with its body directly upright and the head out of the water. Several shots and repeated blows of the paddle were required before it finally sank.

The alligators of the Okefinokee showed no variation, so far as our observations went, from the ordinary form of *A. mississippiensis*, which has been sufficiently well described by various authors to make a description in this record unnecessary. The young which were preserved agree also with the published descriptions and are most brilliantly marked in the smaller specimens. As the animal increases in age, the fifteen transverse yellow bands become fainter and the dorsal crest more pronounced. In the very young specimens the dorsal tubercles of the neck are entirely absent.

No nests of eggs were found, but a number of eggs were taken from the bodies of those killed. In one specimen (No. 6,493) were found twenty mature eggs, ready for depositing. These eggs have completely formed shells which are thin and soft, not brittle, and grayish-white in color, with a granular coating which rubs off on handling. The average length of these eggs is 3 inches and the average diameter $1\frac{5}{8}$ inches. From a female $8\frac{1}{2}$ feet long, taken on Billy's Lake, June 11, 1912, were taken 42 embryonic eggs ranging in size from $\frac{1}{4}$ to $1\frac{3}{4}$ inches in diameter, almost spherical and of a dark orange color. The skin of these eggs is soft and smooth and covered with shreds of connective tissue. With this female was a large male about 11 feet long.

Both the eggs and the flesh of the alligator are eaten by the inhabitants of the swamp, and the tails of the young proved to be a very acceptable article of diet. The meat is firm and white and in taste somewhat resembles that of pike.

One alligator was taken by Mr. John Needham on Billy's Lake in December, 1913, but this was the only specimen seen on the trip made at that time. Evidently, however, the alligators do not entirely disappear even during that season of the year.

17. **Crocodilus americanus** Laurenti.

No crocodiles were found in the Okefinokee. Nevertheless, there is a persistent idea throughout the region of the swamp that these

animals have been seen in its waters and are still occasionally to be encountered, although the evidence offered is very meagre and the descriptions given of the so-called crocodiles are far from satisfactory.

The natives describe the crocodile as being much darker in color than the alligator and state that in the crocodile the upper jaw is movable instead of the lower. This latter notion, it may be observed, is common throughout this part of the country, and is insisted upon by many hunters, although the basis for the idea is not evident. On the other hand, the chief points of scientific distinction between the two animals is never touched upon by those who profess to have seen the crocodile, and even such striking differences as the longer snout and the more active movements of the latter animal appear never to have been noticed.

Bryant Lee states that crocodiles have been taken in the region around Cow House, but that he has never seen one south of Honey Island. Joe Saunders insists that he has seen crocodiles in a creek flowing into the Suwanee River in Clinch County, while Jackson Lee says that he knows of at least two crocodiles being taken in Billy's Lake. These hunters, when pressed for details, state that the chief distinctive character of the crocodile is the *color of its eyes*, which they describe as red or orange, and the much darker color of the body.

These men have spent their lives in the swamp and are remarkably close observers, and it is evident that the form which they have in mind is in some way different from the common alligator, but it seems unlikely that it is *Crocodilus americanus*.

II. SNAKES.

BY A. H. WRIGHT AND S. C. BISHOP.

No State in the United States has furnished more distinctive and peculiar snakes and no area has received more herpetological attention than Florida, yet none of these numerous ophidian collectors and students has ever entered Okefinokee at Florida's northern border. The nearest approach came about twenty-five years ago in the visit of the ornithologist, Mr. C. F. Batchelder, of Cambridge, Mass. He spent a day or two on Mitchell and Black Jack Islands. To the eastward, at St. Mary's, Ga., and at Fernandina, Fla., he took the following species:

Cyclophis æstivus,
Osceola elapsoidea,
Osceola doliata doliata,
Ophibolus getulus getulus.

In Florida, at Gainesville, the snakes secured by James Bell in

1879, July, 1880, and April 7–18, 1882, prove most instructive, for this locality is not far south of Bay Swamp, the Floridan extension of the Okefinokee Swamp. Mr. Bell has the following list:

*Abastor erythrogrammus,**
Farancia abacura,
Heterodon platyrhinus,
*Heterodon simus,**
Cyclophis æstivus,
Zamenis constrictor,
*Zamenis flagellum,**
Coluber quadrivittatus,
*Compsosoma corais couperii,**
*Pityophis melanoleucus,**
Osceola doliata parallela,
Osceola elapsoidea,
Ophibolus getulus getulus,
Natrix fasciata fasciata,
Natrix fasciata pictiventris,
Natrix fasciata sipedon,
Natrix fasciata erythrogaster,
Eutænia sackenii,
*Elaps fulvius,**
*Ancistrodon contortrix,**
Crotalus adamanteus.

Of the above 22 species, seven (with asterisks) are not in our list. All of these seven we might expect in southeastern Georgia, and were in our working hypothetical list before the trip was taken. They represent the remaining Austroriparian forms which were not taken by us, and with the truly Floridan peninsular snakes almost complete the whole list of southeastern United States forms. Furthermore, these seven (with *Abastor erythrogrammus*, a mud and aquatic snake eliminated from consideration) represent the assemblage of southeastern species which most prefer the dry pine forests of the Atlantic coast or dry open or sandy fields where the gopher turtle occurs. We have no doubt that these seven occur on the Atlantic seaboard to the immediate east of Okefinokee and also in its outskirts. In fact, the natives held that there were several kinds of snakes outside the swamp which were not within it, and, among these, they named the coachwhip snake. Besides, the gopher turtle, the associate form of the above seven, occurs outside the swamp, but not within it.

To the northwest about forty miles, at Nashville and Alapaha, Ga., William J. Taylor, from July 19 to November 18, 1881, took seven species of snakes, of which *Elaps fulvius* does not appear in our list. The seven are:

Farancia abacura,
Heterodon platyrhinus,
Haldea striatula,
Natrix fasciata sipedon,
Sistrurus miliarius,
Ophibolus getulus getulus,
*Elaps fulvius.**

In addition to these collections from Messrs. C. F. Batchelder, J. Bell and W. J. Taylor, Cope also had material from St. Simon's Island.

In the earlier days, Holbrook received some material from the region to the eastward of the swamp (*vide Tropidonotus taxispilotus*).[20] In another place (Vol. IV, p. vi), he writes: "J. Hamilton Couper, Esq., of St. Simon's Island, Georgia, has also furnished me with several Serpents of that state; and to him I owe a knowledge of the Gopher Snake, perhaps the largest and most beautiful of our Serpents." Of this form, Mr. Couper says:[21] "I have only seen it in the dry pine hills, south of the Alatamaha; and I have never met with it in the low grounds even of the same vicinity." This may explain its absence in the Okefinokee. In this connection, it is interesting to observe that the same seven absent forms (except *Compsosoma corais couperii*) occur in Dr. Holbrook's Catalogue[22] of the Ophidia of Georgia. In it 33 species of snakes are listed. In C. S. Brimley's[23] *Records of Some Reptiles and Batrachians from the Southeastern United States* we find 21 species recorded from Georgia. Five (*Compsosoma corais couperii* and *Abastor erythrogrammus* being absent) of the seven species missing from Okefinokee are given in his list as taken either at Riceboro to the northeast or at Mimsville to the west.

In 1871 and 1876, Paul Fountain visited this area and he writes:[24] "I can assure the lover of Nature, if he is prepared to run the risk of fever, that the farther he forces his way into its gloomy depths, the more remarkable and beautiful will be the forms of animal and vegetable life he will discover." Later he says: "A greater number of reptiles may be found in this swamp than in any other spot I know of in the States." And he reserves his discussion and digression on snakes in general for his chapter on *A Day in a Cypress Swamp* (Okefinokee).

In 1888, Cope published *On the Snakes of Florida*,[25] and this paper has considerable bearing on some of the Okefinokee species; but, inasmuch as it is embraced in Cope's great work,[26] *The Crocodilians, Lizards, and Snakes of North America*, we will not consider it in detail. In 1896, the next list of some pertinence is *Remarks on Some of the Floridan Snakes*, by Charles B. Cory.[27] He enumerates 15 of the commoner species of this State.

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[20] N. A. Herpetology, 1842, Vol. IV, p. 36.
[21] N. A. Herp., Vol. III, pp. 76, 77.
[22] White's Statistics of the State of Georgia, 1849, Appendix, p. 14.
[23] Biol. Soc. Wash., 1910, Vol. XXIII, pp. 8–18.
[24] Fountain, Paul. The Great Deserts and Forests of North America, New York, 1901, pp. 65, 66.
[25] Proc. U. S. Nat. Mus., Vol. XI, pp. 381–394.
[26] Rep. U. S. Nat. Mus., 1898, Washington, 1900, pp. 153–1270.
[27] Hunting and Fishing in Florida, Boston, 1896, pp. 124–131.

From September, 1892, to July, 1893, Prof. Einar Loennberg,[28] of University of Upsala, Sweden, was engaged in collecting in Florida and his *Notes, etc.*, published in 1895, proves one of the most important herpetological papers on southeastern United States in the last quarter of a century. He secured 30 species of snakes. Nine of his 30 species are not represented in our collections, three being genera peculiar to Florida, one, *Tantilla coronata*, occurring in Georgia as well, not being recorded, however, from the Okefinokee Swamp, and five proving of the same assemblage as Bell's seven (Gainesville) species missing from the Okefinokee Swamp, because they are more especially dry pine land forms.

The 21 species taken in the swamp represent a distinctly Austroriparian element which does not entirely shun moisture. The collection of 165 individuals apportioned numerically among the 21 different species of snakes indicates very roughly the degree of abundance on Billy's Island or its immediate environs. The list follows:

Heterodon platyrhinus	38	*Elaphe obsoletus*	6
Ancistrodon piscivorus	16	*Opheodrys æstivus*	5
Thamnophis sirtalis ordinatus	15	*Farancia abacura*	3
Coluber constrictor	13	*Diadophis punctatus*	3
Lampropeltis getulus	13	*Crotalus horridus*	2
Tropidonotus taxispilotus	11	*Elaphe guttatus*	2
Thamnophis s. sackeni	10	*Storeria dekayi*	2
Tropidonotus fasciatus	10	*Storeria occipitomaculata*	1
Lampropeltis doliatus coccineus	6	*Cemophora coccinea*	1
Sistrurus miliarius	6	*Crotalus adamanteus*	1
		Haldea striatula	1

None of Cope's (1900, p. 1207) four peculiar snake genera (*Stilosoma*, *Seminatrix*, *Rhadinea* and *Liodytes*) of the Floridan region enter the swamp, and none of the Floridan sauria, unless the other limbless lizard described by the Lees proves to be *Rhineura*. One lone specimen of *Hyla gratiosa* of the amphibians was taken, and, with the birds, there is a Floridan tendency, but it is not very pronounced. Of the above 21 snakes, *Thamnophis s. sackenii* of Cope's Floridan snakes occurs in the swamp, and there are forms which might be termed *T. compressicaudus* and *T. f. pictiventris*.

The largest portion of the Okefinokee material in this report represents the collection made by the Cornell University expedition during the summer of 1912 (May 28–July 13). The party included

[28] Loennberg, Einar. Notes on Reptiles and Batrachians collected in Florida in 1892 and 1893. Proc. U. S. N. Mus., Vol. XVII (1894). Washington, 1895, pp. 317–339.

Profs. J. C. Bradley and C. R. Crosby, of the Department of Entomology; Dr. A. H. Wright, of the Department of Zoology; Headmaster W. D. Funkhouser, of the Ithaca High School; Messrs. S. C. Bishop and M. D. Leonard, of the class of 1913, and Paul Battle, of Bainbridge, Ga. During the first week, Mr. E. L. Worsham, State Entomologist of Georgia, and Mr. C. S. Spooner, Assistant State Entomologist, were also with the party. Later, from July 15 to November 1, 1912, the Lees judiciously collected material which added four species to our list and nicely augmented our series of previously known forms. In the fall of 1913, Prof. J. C. Bradley and Paul Battle spent a week on Billy's Island and brought out a few reptiles. In December, 1913, Profs. J. G. Needham and J. C. Bradley, Messrs. John Needham and Paul Battle made a trip of ten days into the Okefinokee and collected considerable data on the winter conditions. Some of their material they brought out, but they left a container which was filled by the Lees by August 1, 1914. This collection has not been received and is not incorporated in this report. All the members of these various parties and, particularly Prof. Bradley, collected snake material and data and, to each of them we are deeply indebted for aid, good communal spirit and material encouragement. Acknowledgments are due Dr. Leonhard Stejneger, of the United States National Museum; Dr. Witmer Stone and Mr. H. W. Fowler, of the Academy of Natural Sciences of Philadelphia, for the privilege of examining types in their respective collections, and to Messrs. R. W. Bennett and Cornelius, of Fargo, Ga., without whose courteous assistance it would have been impossible to have transported our material out of the swamp.

The Lees proved very efficient collectors. They enjoy life in this naturalist's paradise and do not live in constant fear of the numerous venomous snakes and dangerous animals of the swamp. They do not alter their course in life because of them, though they respect and appreciate the danger and know what bad wounds some can inflict. They bathe in the lakes where many accidents might befall them, but usually do not. The children go barefoot and were our best and most vigilant scouts about the Lees' clearing. Many a snake, both large and small, they "stepped on," if they did not "cromb" it with a stick. They knew not the noose, and to it we had little recourse except on rare occasions. The gun proved very serviceable in the thickets. The Lees' fields and clearing were the resort of turtles, lizards and oviparous snakes which sought them for breeding purposes.

Hither, as in other parts of the swamp, the bears, raccoons, opossums and other mammals come for the eggs buried in the sand. Over this same ground the king snake, black snake and pilot snake search for the same quarry and the reptiles which lay the eggs. The natives have a very good idea of the economic value of the various snakes and spare most of them, except the truly poisonous forms and what they call the "Water" and "Highland Moccasins" (*Tropidonotus* and *Thamnophis*). One of the many rôles which the natives accredit the black and turkey vultures is that of enemies of snakes and some birds of prey, *e.g.*, the Buteos engage in the same practice. The snakes also suffer from the herons, ibises and cranes, but with these the reptiles are a second choice when frogs and toads are available.

The number of snakes with internal parasites is surprisingly large, 37 of the 165 being thus afflicted, or 8 of the 21 species. They are:

Heterodon platyrhinus	14	*Thamnophis s. sackeni*	2
Ancistrodon piscivorus	6	*Lampropeltis getulus*	1
Coluber constrictor	5	*Sistrurus miliarius*	1
Tropidonotus taxispilotus	5		
Thamnophis s. ordinatus	3		37

No doubt, other species also suffer, for this list represents the species of which we had the largest series. The above species are about equally distributed between the terrestrial and aquatic groups. In number, the former are 24 and the latter 13; but, if the spreading adder be eliminated, the terrestrial forms lead by 3. It is a significant fact that the species which are the worst sufferers are also inveterate feeders on toads and frogs of all kinds, and it is quite possible that these nematodes and other parasites reach the snakes through their food.

According to habitat, these snakes may be divided as follows:

Islands.

Heterodon platyrhinus,
Coluber constrictor,
Lampropeltis getulus,
Crotalus adamanteus,
Crotalus horridus,
Sistrurus miliarius,
Thamnophis s. ordinatus,
Lampropeltis d. coccineus,
Elaphe obsoletus,
Opheodrys æstivus,
Diadophis punctatus,
Elaphe guttatus,
Storeria dekayi,
Storeria occipitomaculata,
Haldea striatula,

Cypress Bays.

Ancistrodon piscivorus,
Farancia abacura,
Thamnophis s. sackeni,
Tropidonotus taxispilotus,
Tropidonotus fasciatus.

Prairies.

Thamnophis s. sackeni,
Tropidonotus fasciatus.

Water Courses.

Ancistrodon piscivorus,
Tropidonotus taxispilotus,
Elaphe obsoletus.

Transition Zone Between Islands and Cypress Bays.

Farancia abacura,
Heterodon platyrhinus,
Crotalus adamanteus,
Coluber obsoletus,
Diadophis punctatus,
Storeria dekayi,
Haldea striatula.

If these snakes be considered from the point of view of locomotion, they fall into the same four groups which Loennberg (1895, pp. 336, 337) made, and the snakes are quite similarly, but not absolutely, arranged as he found them:

Swimming Forms.

T. taxispilotus,
T. fasciatus,
T. s. sackeni,
A. piscivorus,
F. abacura.

Burrowing Forms.

H. platyrhinus,
F. abacura,
L. d. coccineus,
L. getulus.

Crawling Forms.

T. s. ordinatus,
C. constrictor,
L. getulus,
L. d. coccineus,
S. miliarius,
C. adamanteus,
C. horridus,
E. obsoletus,
D. punctatus,
E. guttatus,
S. dekayi,
S. occipitomaculata,
H. striatula.

Climbing Forms.

E. obsoletus,
E. guttatus,
O. æstivus,
C. constrictor,
L. d. coccineus.

Or, viewed from the standpoint of breeding, they are about equally divided: the poisonous snakes, *Tropidonotus, Thamnophis, Storeria* and *Haldea,* being ovoviviparous, and all the rest oviparous.

Finally, if the Okefinokee snakes be grouped according to food, based largely on stomach contents, but also on observations of the haunt, time of activity in the swamp and on the keen knowledge of the natives, these snakes are arranged as follows:

Mammals, Birds or their eggs.

E. obsoletus,
L. getulus,
C. constrictor,
S. miliarius,
C. adamanteus,
C. horridus,
A. piscivorus,
E. guttatus (*mammals only.*)

Lizards (or their eggs).

C. constrictor,
S. miliarius,
L. d. coccineus,
L. getulus,
(*C. coccinea*).

Fish.

T. s. sackeni,
T. taxispilotus,
(*T. fasciatus*),
A. piscivorus,
L. d. coccineus.

Turtles (or their eggs).

L. getulus,
A. piscivorus,
E. obsoletus.

Frogs.

T. fasciatus,
T. taxispilotus,
H. platyrhinus,
C. constrictor,
E. obsoletus,
A. piscivorus,
S. miliarius,
T. s. sackeni,
T. s. ordinatus.

Insects, Worms, Mollusks, etc.

H. platyrhinus,
T. s. sackeni,
T. s. ordinatus,
S. miliarius,
L. d. coccineus,
D. punctatus,
H. striatula,
S. occipitomaculata,
S. dekayi,
O. æstivus.

It is apparent at once that insects, etc., prove the important food of the smaller snakes, ten of the 21 species falling in this group and

only one of the larger snakes being in this category. Doubtless, all the 21 species will eat insects to a certain extent. The species which are almost exclusive insect feeders are *Haldea striatula, Storeria occipitomaculata, Storeria dekayi* and *Opheodrys æstivus.* The reader must bear in mind throughout this discussion we are treating Okefinokee snakes and not the species throughout its entire range.

With the larger snakes, the food most generally sought is Anura or Amphibia in general. It is *par excellence* the food of the aquatic snakes, and with these four or five species it usually is some species of *Rana*, though *Acris, Chorophilus* or *Hyla* may rarely appear as their prey. Equally important are frogs in the food of the larger land snakes, 5 species being addicted to them. With these the southern and oak toads (*Bufo*) are easily of first importance, with the tree frogs (*Hyla*) and the narrow-mouthed frog (*Engystoma*) occupying second and third places. In fact, these 10 snakes prefer the soft-bodied frogs and toads to any other food of the swamp (reptilian eggs not considered), and if they were to be restricted to any one of these categories they belong to this group.

Fish enter into the food economy of all the aquatic species, the bream and killifishes proving the common bait. *L. d. coccineus* ate fish, as doubtless some of the island forms do when the smaller fish become cut off in landlocked pools on the islands.

In general, the lizards are swift (except the ground lizard), and fall prey only to some of the swifter coursers of the islands. However, at least 5 species ate them or their eggs. The turtles when young and soft are occasionally taken by the moccasins and possibly by the other aquatic snakes, the young soft-shelled turtles (*Platypeltis ferox*) being the species most attacked. On the land, the turtles' eggs are eaten by at least 2 species, if not by many more. This source of food is one of the commonest of the swamp for man, mammals and snakes. At least one-third of the species are cannibalistic and will eat snakes, either adults or young, or eggs.

The warm-blooded groups, birds and mammals, suffer from the same foes. Seven species of the largest snakes of the swamp assail them, their eggs or young. Four of these seven are the four poisonous snakes of the swamp, while the other three are the pilot, black and king snakes. In addition, the mammals have an inveterate foe in the corn snake, which apparently does not molest birds. None of these seven or eight species are aquatic but one, the moccasin.

The three omnivorous coursers on the islands are the king snake, pilot snake and the black snake, while in the water the only snake

which includes insects in its diet to any extent is the southern riband snake. One must be impressed with the immense abundance of the reptilian forms, the restricted island quarters for these reptiles and the need of great numbers to keep each species existent under such strenuous vicissitudes. Each form, fish, amphibian, reptile, bird or mammal, has untold foes which are close at hand, fellow-travellers of the same course and seekers of the same breeding grounds already crowded. Never have we been so struck with the incessant warfare of primeval nature as on these islands of the Okefinokee.

Another very interesting fact is the isolated nature of the place where these 165 snakes were taken. They are virtually a collection of Billy's Island ophidians with a few other islands and portions of the swamp represented. Our series of each species becomes, therefore, very significant if several variants appear. They cannot be designated as geographical subspecies or varieties and must be considered only as indicating the inherent range of variation which a species may manifest in one limited geographical region, not what might appear in an extensive or expansive stretch of territory. Hence, the value of the material, though not as numerous as might be desired.

Without doubt, many of the conclusions and observations in this paper are not new and are only corroborative of previous work, but they may have interest because of their independent nature. The more significant conclusions are:

1. That *Tropidonotus fasciatus* and most of its subspecies, *T. compressicaudus*, *T. ustus*, *T. bisectus* and *T. rhombifera*, need to be restudied before they can be finally accepted.

2. That *Elaphe obsoletus confinis*, *E. o. lemniscatus*, *E. spiloides*, *E. lætus* and *E. quadrivittatus* are too closely intergradient to be so distinctly designated.

3. That *Lampropeltis getulus getulus*, *L. g. sayi* and *L. g. splendidus* are possibly variations within one region.

4. That *Thamnophis sirtalis ordinatus* is the color form of the Okefinokee, though its recognition as a good subspecies may be questionable.

5. That *Lampropeltis d. coccineus* and *Osceola elapsoidea* are to be considered one and the same.

6. That *Diadophis a. stictogenys* is not deserving of separation from *Diadophis punctatus*.

7. That *Farancia abacura* may have white-bellied forms as well

as those with the typical red ventral coloration, and that this albinistic character is not solely an adult or young variation.

8. That our specimens of *Heterodon platyrhinus* are one-third *platyrhinus*, one-third intermediate and one-third *niger*; that possibly *niger* is an adult end phase, and that one *platyrhinus* specimen agrees perfectly with *Heterodon brownii* Stejneger, both in the absence of the azygous plate and in coloration.

9. That the two specimens of *Storeria dekayi* have not 17, but 15 rows of scales, like *S. occipitomaculata*, and one of the two specimens has the oculars not 1–2, but 2–2, as usual in the red-bellied species, the lone representative of which has the ocular formula 3–2.

10. That the range of the southern ribbon snake, *T. s. sackeni*, is not restricted on the Atlantic coast to Florida.

11. That *C. horridus* of the Okefinokee is distinctly the light canebrake form of this species.

1. Farancia abacura (Holbrook): Horn Snake; Red-bellied Snake; Hoop Snake; Rainbow Snake; Mud Snake; Checkered Snake.

Three specimens were taken, and from native accounts it apparently is fairly common, but hard to secure. In distribution this species reaches from Virginia to Florida and from Indiana and Illinois to Louisiana and rarely into Texas. The nearest records are from Allapaha, Ga., to the northwest, and from Gainesville, Fla., to the direct south.

Coloration.—The horn snake is one of the most beautiful snakes of North America. The ground color is a blue-black, the smooth and shining scales have an enamelled surface, and the gastrosteges and the scales along the sides have a fluted appearance. Every labial, mental and gular plate has a blue-black spot in its middle. The color of the back extends to the gastrosteges in vertical bars or inverted triangles, the apices being on the gastrosteges. Usually, at each one of these apices appears an oblong spot, and in the cephalic half of the body, the venter, as a result, presents a row of these spots on either end of the gastrosteges, thus giving a distinct light-colored band down the middle. In the caudal half of the body the vertical bars of opposite sides usually meet or alternate on the mid-ventral line, producing a checkered appearance. The vertical black bars are two scales wide at the end of the gastrosteges and three or four scales wide on the 4th row of scales. The lighter intervals between the dark bars are two scales wide at the end of the gastrosteges and one wide at the 4th row of scales. Each gular gastrostege has a black band across it.

The lighter color of the venter extends to the 4th row of scales in the younger specimens. In these, usually at the neck of the light interval, there appears one or two blue-black spots to suggest the almost complete invasion of the body color upon these areas in the large specimens where the light areas seldom reach the 2d row of scales and where there are large central black spots on the scales. Our specimens have 63, 64 and 65 light vertical bars or wedges, respectively, or from 50–53 from the anus forward. Curiously enough, the two specimens which we first took alive, one 151.7 cm. long and the other 43 cm., were *white beneath, and not red.* The other preserved specimen has also the whitish appearance. Two of the specimens in alcohol may possibly have a slight tinge of pinkish, but it is faint if present at all; surely, it is *not yellow.* These three white-bellied *Farancias* are noteworthy. H. H. Brimley[29] took a large white-bellied adult male, which was coiled with a normal male and female *in coitu*, but our specimens, however, are not all adults, one being only 43 cm., the largest, 151.7 cm., and another intermediate 81.1 cm. The native present when we caught the largest specimen asserted that he had seen red-bellied forms of this snake, and, in December, 1913, Profs. Needham and Bradley saw a beautiful red-bellied individual of this species.

Dimensions and Variations.—The gastrosteges were 194, 195 and 196, respectively, in our three specimens; the urosteges, 39, 39, 42; the scales 19–19–19; supralabials 7; eye over 3d and 4th supralabial; infralabials 8; loreal elongate; temporals 1–2; nasal with groove below nostril; in C. U., No. 6,108, a groove above the nostril as well; anal plate and the gastrostege before it divided; in the caudal half of the body 6 or 8 rows of scales on the dorsum with a suggestion of a keel on them.

Habits.—The largest specimen (No. 6,108) was taken in a dark cypress thicket (between Billy's and Gallberry Islands), wherein a Florida barred owl had retreated. In water ankle deep or more our guide accidentally stepped on the snake, thinking it at first a moccasin. He recoiled and then quickly shot it. The smallest specimen (No. 6,107) was secured in the most difficult tangle (Minne Lake trail to Minne Lake Islands) of the whole swamp, where the magnificent cypress trees and associated undergrowth were thickest. On a mat of sphagnum it rested, and when alarmed quickly shot down

[29] Brimley, C. S. Zoology of Lake Ellis, N. C., *Proc. Biol. Soc. Wash.*, Vol. XXII, 1909, p. 134.

into it. Our first hold of this snake was not secure and it as quickly began burrowing the second time. From all that we observed of the living snakes of this species we would consider them timid, harmless burrowers. They are decidedly inhabitants of the twilight parts of the swamp, and their eyes suggest such a habitat. If found during the day, they appear in the dark, gloomy cypress ponds on the islands or amongst the dense vegetation of the deepest and most inaccessible regions of the swamp. We discovered no particular superstitions regarding its horny tip. It is curious to find the hill hoop-rolling story also associated with this species, which to my mind is one of our most aquatic species, and the names "cypress" or "sphagnum" snake would be equally appropriate with some of the names suggested by its structures.

Food and Breeding.—None of the specimens had food in their alimentary tract and no parasites were found. The natives relate how the thunder snake (*L. getulus*) digs beneath rotten logs and other cover for the adults and young of this species. Of the breeding habits of this oviparous form we know little. The natives assert that the progeny of one female sometimes reaches 40 to 43.

2. Diadophis punctatus (Linnæus): Ring-necked Snake. Plate III, fig. 1. Fig. 5.

This species is probably fairly common on the islands of the swamp. Three specimens were secured on Billy's Island between June 11 and 15, 1912.

Coloration.—All three specimens are bluish-black or brown above, the color extending on to the end of each gastrostege. These black spots on either extremity appear as a row on each side of the venter. In No. 6,105 they are very obscure on the neck region. In all three the dorsal scales are with pale edges and with numerous fine light specks. In No. 6,104 the edges of the dorsal scales are opalescent. In No. 6,106 there is a median row of body-colored spots down the venter to the anus, all the urosteges and gastrostege No. 2 being without spots; the same applies to No. 6,105 with the urosteges and gastrosteges Nos. 1–5, 8 unspotted; in No. 6,104, the median row is very interrupted, no spots being on gastrosteges Nos. 1–20, except No. 3, and none beyond No. 133, while between Nos. 21–133 there are several missing. In No. 6,105, the nuchal half collar is 1–2 scales wide; in No. 6,106 it is the same width, but interrupted by a median dorsal row of black scales, while in No. 6,104 it is faint except on the lower sides. In No. 6,105, the mental and labial regions are almost immaculate, a few infralabials being with faint black spots; in No. 6,104, each infralabial is well marked with one

or more black spots as the symphyseal is; in No. 6,106, the genеials as well have these spots.

Dimensions and Variations.—The total length of these three snakes reaches from 19.5–29 cm.; the tail from 4.7–5.8 cm. or $4\frac{1}{7}$–$5\frac{1}{4}$ in the total length; the gastrosteges are 143–150; the urosteges, 39–46; anal divided, and in one the gastrostege ahead is also divided. Tail very spike-like and sharp. Scales 15–15–15; temporals 1–1; oculars 1–2 in No. 6,106, the preocular large on the right side and small on the left side, the prefrontal taking the place of the normal upper preocular, 2–2, in Nos. 6,104 and 6,105. The supralabials in No. 6,106 are 8, with the eye resting on the 4th and 5th; in No. 6,105 on the right side they are 8, with eye on the 4th and 5th, while on the left side there are 7, with the eye on the 3d and 4th; in No. 6,104 there are 7 supralabials on each side, the eye being over the 3d and 4th on each side. In Nos. 6,105, 6,106 the supralabials have the clear band of ventral color, but in No. 6,104 this color is heavily encroached upon by black.

Fig. 5.—*Diadophis punctatus* (Linn.)

In view of Cope's establishment of *D. amabilis stictogenys* upon three specimens from New Orleans, Pearl River, Miss., and Savannah, Ga., the last locality not far from Okefinokee Swamp, our three specimens prove interesting. To find these three showing such a gamut of differences is rather fortunate. Our specimen No. 6,104 is almost a duplicate of Cope's *D. a. stictogenys*. It has 7 supralabials, a speckled gular and labial region and the eye resting on the 3d and 4th supralabial; but like his specimen, the three abdominal rows of ventral spots, the 150 gastrosteges and other characters suggest *D. punctatus*. It was taken under the same log as an almost immaculate-chinned *D. punctatus*, which has 8 supralabials on the right side and eye on the 4th and 5th and 7 supralabials on the left side and eye over 3d and 4th. No. 6,106, captured in a similar habitat, is a good *D. punctatus* in scutellation, but has the gular and labial regions spotted as in Cope's subspecies. The numerous variations in these three specimens, the circumstances of their capture, the isolated character of their habitat (Billy's Island), an inspection of Cope's type and Dr. Stejneger's previous decision and

concurrence (study of *Diadophis* in manuscript)—all force the authors to consider this subspecies untenable.

Habits.—This attractive snake was found during the day under cover, usually under logs near the cypress edges of Billy's Island. It seemed to prefer localities near the edge of the thicker woods. In one case it was under a log in a place near and exactly similar to the situation described for *Haldea striatula*. In the other instance, the two were taken (June 11, 1912) under a log near Billy's Island landing at the woody edge of cultivated fields. The *D. a. stictogenys* specimen was first taken and a few minutes later the other specimen was found under the same log. The former may have been seeking the sandy fields of the Lees where lizards, snakes and turtles resort in great numbers to lay their eggs. This specimen had six unlaid eggs which measured as follows: 18 x 9 mm., 19 x 9, 19 x 9, 20 x 9, 20 x 9, 21 x 10. The covering is thin and quite pinkish in alcohol. This species seems as nocturnal in Okefinokee as our experiences with it elsewhere suggest. These specimens had insect and worm remains in their alimentary tracts.

3. **Heterodon platyrhinus** Latreille: Hog-nosed Snake; Hog-nose; Spreading Adder; Spreading Viper; Blowing Adder; Blow Snake; Blowing Viper; Spotted Adder; Flatheaded Adder; Puff Adder; Sand Viper; Black Viper. Plate III, fig. 7; fig. 6.

Thirty-eight specimens were secured, of which 16 were young snakes; one was a cast skin.

Coloration.—In coloration our series show all possible patterns. The 16 young were all of the spotted phase and manifested the following pattern: The ground color may be yellowish, brownish or reddish. Down the back is a series of 26–32 spots and on the tail 7–9 spots which become transverse bands. The color around these dorsal spots is brighter or lighter than the surrounding body color. Alternating with and almost touching the corners of the dorsal spots is a series of lateral spots. In the cephalic region, one of these spots of each side with a pair of successive dorsal spots form a quartette—an arrangement soon lost in the caudal part of the body and seldom seen in adults. Beneath these spots may be seen one or more series of small spots, not very distinct in form. The venter is grayish or greenish-white, heavily blotched with black or brownish. The head has a black bar connecting the upper anterior edges of the orbits; another bar from the eye to the angle of the mouth; and a third, on occipital plates, posterior margins of supraorbitals and frontal. This black spot has a backward extension on either side of the nape or neck and usually a small median extension

just back of the occipital plates. Often this median prolongation is cut off and surrounded by body color. Usually on the occipital suture and occipitofrontal suture appears a light spot.

In some of the adults the same schema of coloration obtains as in the young, except that dorsal and lateral spots are less distinct as such and become more transverse areas with light intervals. Furthermore, the supralabials are more prominently spotted in the young.

Of the 21 specimens of adults, 8 were of the black (*niger*) type with slaty-gray below. In most of these 8 the gular scales and whole chin except in two become the darkest portion of the whole venter. Of the spotted forms (*platyrhinus*), we had a few with the brick-red on the head and neck and somewhat on the body. In the intermediates, the approach to the black phase begins in the head region and the head first becomes black, or it and the neighboring cephalic region. In this process the transverse light intervals remain brightest and persist longest in the tail region. Some of the specimens are almost *niger* in the cephalic region, but *platyrhinus* in the caudal half, or three-quarters *niger* with the scales of the light intervals of the caudal region with incoming black centres. About 7 of the adults were true spotted adders and 6 intermediate. Thus, of the adults we have an almost equal division of 7 spotted, 6 intermediates and 8 blacks. Most of our largest specimens were black or fast approaching that stage. The black seems to be an end phase of size or age, possibly not always attained in an individual, but certainly the spotted phase is most prominent in the smaller specimens of the collection. Besides, it might be remembered that none of the 16 young were black, but all true spotted forms.

Dimensions and Variations.—The 16 young vary in length from 13.7–19.6 cm., while the adults are from 35–104.2 cm. (1 ft. 2 inches–3 ft. 5 inches). Possibly the species may reach 4 feet in length and a circumference of 6 inches, largest specimen being 5 inches in girth. The gastrosteges range from 120–146, average 130; the urosteges 30–59, average 48; the anal is divided, in several with half a gastrostege ahead; the scale row formula of 18 individuals is 25–25–19, the other formulæ being 23–23–17, 24–22–17, 24–24–19, 25–21–19, 25–22–21, 25–23–18, 25–23–19, 25–25–18, 25–25–20, 25–25–21, 25–25–23, 26–25–21, 27–24–18, 27–25–19, or in the middle of the body from 21–25, exceeding the usual range of the 3 species of *Heterodon* by the loss of two rows (in 21-rowed condition) or in the cephalic region extending from 23–27, two rows beyond the normal

25 rows of *Heterodon platyrhinus* and *simus*. The temporals are 3–4 on both sides in twenty-seven specimens, 3–4 on one side and 3–5 on the other in three specimens, and 3–4 and 4–5 in one specimen; the supralabials are 8 in twenty-seven specimens, 9 in seven specimens and 9–8 in three specimens; the infralabials are 11 in fifteen specimens, 10 in three specimens, 12 in five, 13 in one, 10–11 in four, 10–12 in three, 11–12 in five and 12–13 in one. The orbital ring exclusive of the supraocular is 10 on both sides in thirteen specimens, 11 in one, 9–10 in two, 9–11 in two, 10–11 in fourteen, and 8–10 in two, *i.e.*, 22 of the 38 with number of oculars different on the two sides.

Rarely, the azygous plate may be cut off from contact with the rostral by the prenasals (No. 6,186). One spotted specimen (No.

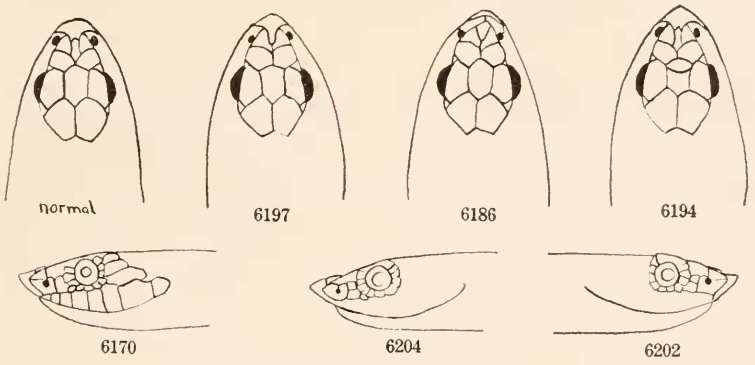

Fig. 6.—*Heterodon platyrhinus* Latr.

6,197) has not the characteristic azygous plate at all. Unlike Dr. Stejneger's *Heterodon browni*,[30] this specimen has the posterior projection of the rostral more than one-half of the suture between the internasals and their mutual suture, therefore less than that between the prefrontals. Otherwise, it is very much like it. The specimen has the following scutellation: gastrosteges, 123; urosteges, 55; anal divided; scales 25–21–19; supralabials 8; infralabials 11; orbital ring 10, not including the supraocular; temporals 3–5 on the right side and 3–4 on the left side. These characters and a very similar coloration bring it in almost perfect agreement with Dr. Stejneger's *H. browni* from the other end of Florida, namely, Lemon City. A black individual (No. 6,194) has the frontal transversely divided into two plates. One specimen (No. 6,202) has 2 loreals on either

[30] Proc. Biol. Soc. Wash., XVI, pp. 123, 124.

side, and two others (Nos. 6,178 and 6,205), both small individuals, have 2 loreals on one side and 1 on the other. Another (No. 6,204) has 2 loreals on one side and 3 on the other, if an extra scale between the oculars, loreals and 3d and 4th supralabials be called a loreal. This small extra scale also occurs in No. 6,170.

Habits.—This interesting snake proved very common around the Lee's sandy clearing and in all dry parts of the swamp. It was the first form to be observed and of it more specimens were taken than of any other species. One might find it beside the trails or on the islands where no human courses led. They were often taken about and in the corn, "chufa," "goober" and "yam" fields of the Lees, where the snakes probably resort for breeding. Here it did not seem to be solely a case of light-spotted phase for dry and sandy places and dark phase in more woody and moist situations. In the same open fields we find one phase one day and the other the following day. In two instances we took adult spotted and black phases within 40 feet of each other. We dare not make a distinction between the two as to habitat, sex, food, etc., unless it be size or age. In this case, often the oldest ones are not always black or blackish, but they seem to tend that way. Of its "spreading" or flattening we saw evidences, and the natives are well aware of the assorted defensive repertoire of this curious snake. They had none of the superstitions about the emanations from it affecting the atmosphere, nor did they believe that it "spat" its poison when hissing. In all our captures we saw no particular signs of ill temper.

Breeding.—This snake is oviparous. All through the month of June we were finding the snakes in the planted fields of the Lees and more than once almost stepped on the clumsy females of this species. To these fields they came to lay their eggs, and throughout June and later the boys were continually turning the eggs up to the surface as they cultivated their fields in their primitive fashion. The eggs invariably were in sandy soil and were usually 4 or 5 inches beneath the surface. Sometimes in one set as many as 11 or 12 would be found. One specimen (No. 6,175), taken June 3, 1912, had 22 eggs far from ready for ovulation. Another specimen (No. 6,171) had 30 eggs, 16 on the right side and 14 on the left side. But the egg complement may go beyond this 12–30 range. On June 19, Mr. Paul Battle took a large *Heterodon*, from which he and one of the authors squeezed 42 eggs. The females were not all of one phase: some were black, others spotted. The above eggs were white with much thinner integuments than those of the black snake and without

the granules of the latter. These 42 eggs average $\frac{19}{16}$ (30 mm.) x $\frac{13}{16}$ (21 mm.) inches and are not far advanced in development.

Food.—We can hardly hold that the black forms eat frogs and toads and that the light ones will refuse frogs. Of course, if one grants the more moist situations for the dark phase, such a differentiation of diet preference might possibly occur. Our specimens preferred toads. Three had each a southern toad (*Bufo lentiginosus lentiginosus*) in their stomachs. Another had eaten three southern toads, two full grown and one half grown. Three had partaken of beetles and two had taken grasshoppers.

Parasites.—Fourteen of the 21 adults had parasites in their stomachs or intestines. Sometimes the sole contents of the alimentary tract might be a bundle of parasites; in individual cases the stomach would be absolutely filled with them. No snake compares with the spreading adder as a host for these animals, and it may be due largely to its strong Anuran diet.

4. Opheodrys æstivus (Linnæus): Green Snake; Southern Green Snake; Keeled Green Snake; Rough Green Snake; Green Whip Snake; Magnolia Snake; Summer Snake; Green Summer Snake. Fig. 7

Three specimens of this species were secured from Billy's Island, on June 5, 1912, and the other two from July 15–November 1, 1912.

Coloration.—This species is bright green above and usually yellowish-white below and on the labials. In two of our specimens the green of the back extends across the caudal two-thirds of each gastrostege, but the chin and the labials are more or less yellowish-white.

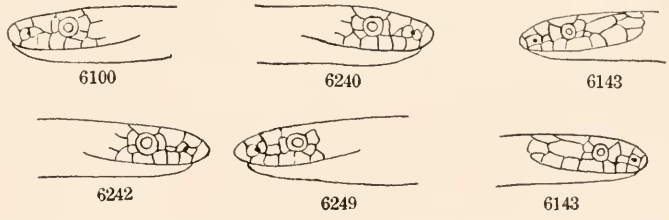

Fig. 7.—Left and middle figures *Lampropeltis doliatus coccineus.* Right-hand figures *Opheodrys æstivus* (Linn.)

Dimensions and Variations.—The total length varies from 31.2–68.1 cm.; the tail, from 12.0–26.7 cm., or 2.5–2.6 times in the total length; the gastrosteges are from 151–160; the urosteges, 130–148; anal divided, in No. 6,233, the ventral plate ahead divided and one of the halves also horizontally subdivided; scales 17–17–15; loreal

present; oculars 1–2, in No. 6,143 caudad of the lower postocular is a small scale hardly a temporal; if this be not a temporal, the temporal formula for all three is 1–2; infralabials 8, the fifth largest; supralabials 8 in one specimen and 7 in the other two, eye resting on the 3d and 4th supralabial; scales 17–17–15, the lower row smooth, the second row very faintly keeled.

Habits, Food.—In our experience this species is decidedly arboreal, and Profs. Crosby and Bradley record the same habitat for it. The specimens were taken from small bushes, and it is a close second to *Elaphe obsoletus* and its allies in its tree-climbing proclivities as the records and its long, slender body testify. This species is quite thoroughly insectivorous, one specimen having undeterminable insect remains in the rectum; another, a partly digested beetle larva, and the largest, parts of a tree cricket and other orthopterous remains with insect eggs presumably belonging to the prey captured.

5. Coluber constrictor L.: Black Snake; Black Racer; Racer; Black Runner; Blue Racer; White-throated Racer. Plate III, fig. 5; fig. 8.

This slender snake was one of the most common species of the islands, but only thirteen of them were captured because of their speed.

Coloration.—In coloration this smooth-scaled snake is shining black above and slaty or plumbeous beneath; the white chin and throat in most of the specimens occupy the mental, infralabials, geneials, first 2–3 gular gastrosteges, the cephalic gulars and the lower edges of the supralabials; two or three of the larger specimens have slaty chins except for a small white spot, which in one case covers parts of the mental, inner border of the 1st and 2d infralabials and the anterior geneials, while in the other it occupies 1st gastrostege and two gulars. One medium-sized specimen (No. 6,152) has more of a brown tinge, and the gastrosteges are slaty except for the caudal borders which are distinctly white; another specimen was decidedly whitish on the caudal ventral third of the body. A young specimen taken June 23, 1912, had spots on the back vaguely discernible and on the venter had a series of pink spots near the ends of the gastrosteges. These spots were lost entirely in the region of the 90th–100th gastrosteges.

Dimensions and Variations.—These snakes vary in length from 71.4–127 cm.; the tail from 18.1–35.4 cm. or 3.4–3.8 times in the total length; the gastrosteges are 176–189, average 182; the urosteges, 92–110, average 103; anal plate divided; in three specimens, the gastrostege ahead of the anal plate is divided or a quarter gastro-

stege is cut out of it; in eleven of the thirteen specimens the scales are in 17–17–15 rows; in No. 6,206, 19–17–15, and in No. 6,207, 19–15–15; preoculars 2, the upper one often with a transverse furrow extending across it for $\frac{1}{2}$ to $\frac{1}{3}$ of its width; postoculars 2, except in No. 6,152, where 3 are on the left side; temporals 2–2–2, rarely 3–3–3, or 3–2–2, or 1–1–2; infralabials 8, in four specimens 9 on one side; loreal 1, but in No. 6,157 there are two, the upper one being cut off from the prefrontal; rarely the postnasal is transversely divided; supralabials 7, in No. 6,154 there are only 6 on the left side, the normal 5th and 6th having united; in Nos. 6,150 and 6,156 8 supralabials are on both sides, while in No. 6,151 there are 8 on one side and 7 on the other; whenever eight supralabials occur, the eye rests on the 4th and 5th supralabials, not on the 3d and 4th. This eight supralabial condition Cope thinks rather peculiar to the Plains (*flaviventris*) or Pacific (*vetustum*) forms of *C. constrictor*.

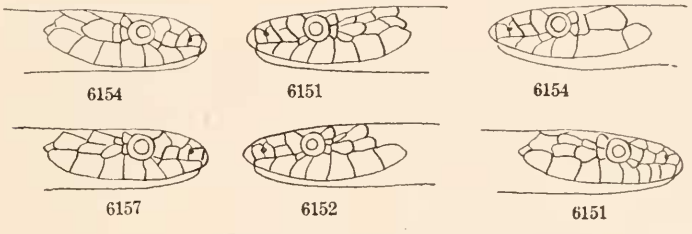

Fig. 8.—*Coluber constrictor* Linn.

The presence of three specimens with 8 supralabials and 1 loreal and one specimen with 7 supralabials and 2 loreals suggests that in *C. stejnegerianus* these characters are hardly of enough value for the establishment of this new form on these slender grounds alone. In fact, distinctive scutellation characters between *C. constrictor* and *C. flagellum* become scarce in the light of this large percentage of 8 supralabials in our collection. The characters of the frontal and color become more than ever the main reliance.

Habits.—This species and the spreading adder are the two most common snakes of the drier parts of the swamp. It seems to prefer the cover of the blueberries and saw palmettoes, where it swiftly pursues its prey. It, however, also appeared commonly about the Lee's clearing, where it was often seen but seldom captured. Only when we could get it in the open did we stand a fair chance of taking it alive, so lightning-like are its movements. In fact, it is fast enough to catch anything which moves on the ground of its environ-

ment, and no doubt its omnivorous appetite is partly due to its speed. It can climb among the bushes, though we usually found it on the ground. The natives think it beneficial and allow it to climb into their corn cribs because it catches the troublesome rats and mice.

Food.—It is considered harmless, and of its antipathy for rattlesnakes we neither saw nor heard any evidence. It doubtless will attack the poisonous snakes, but not to the extent that its archenemy, the king snake, does. Its speed is marvellous, and all the lizards of the swamp prove its prey. This even includes the "race nag" (*Cnemidophorus sexlineatus*), which suffers most; at least two of our specimens had the tails of these lizards in their stomachs, indicating that the lizards were swallowed head first. One cannot help wondering how the blacksnake captures these speedy reptiles. Another species which the blacksnake uses for food is the slowest lizard of the islands, the ground lizard (*Lygosoma laterale*). In some of the specimens we found sand in their stomachs. This species is very fond of frogs and toads, all the dry-land forms being in the list, the toad (*Bufo l. lentiginosus*) occupying first place. One snake had 4 adult Carolina tree frogs (*Hyla carolinensis*) and 1 pine-wood's tree frog (*Hyla femoralis*) in its stomach; all being taken head first. It seems not to scorn insects, beetles being the principal group identified.

Parasites.—This species is quite badly troubled with internal parasites, five of the thirteen specimens having such in their alimentary tracts. The first snake captured—a young one—had mites all along the edges of the gastrostegal plates, a condition subsequently observed in one or two other specimens.

Breeding.—The black snake is oviparous. One individual taken June 1, 1912, had 14 half-sized eggs; another taken June 8 had 11 eggs in about the same condition. On June 21, a specimen was taken with 5 mature eggs. On June 19, Mr. Farley Lee went out to get some smudge wood at 7 P.M., when darkness had just begun. Upon lifting a rotten log he found a female blacksnake which was laying its eggs under the log. It had laid three eggs, and we succeeded in forcing another from the specimen. In the female were five more, making the complement 9 in all. Only two kinds of reptilian eggs exceed these in abundance and ease of discovery, namely, those of the Florida cooter (*Chrysemys floridana*) and of the spreading adder (*Heterodon platyrhinus*). The four eggs above mentioned measured as follows:

32 mm. ($1\frac{1}{4}$ inches) x 18 mm. ($\frac{11}{16}$ inch).
39 mm. ($1\frac{9}{16}$ ") x 16 mm. ($\frac{5}{8}$ ").
36 mm. ($1\frac{7}{16}$ ") x 17 mm. ($\frac{11}{16}$ ").
30 mm. ($1\frac{3}{16}$ ") x 18 mm. ($\frac{11}{16}$ ").

Three others quite fresh in appearance when ploughed up were:

36 mm. ($1\frac{7}{16}$ inches) x 17 mm. ($\frac{11}{16}$ inch).
36 mm. ($1\frac{7}{16}$ ") x 18 mm. ($\frac{11}{16}$ ").
41 mm. ($1\frac{5}{8}$ ") x 16 mm. ($\frac{5}{8}$ ").

Another batch of four taken in a similar way had been developing for a time and at preservation measured:

36 mm. ($1\frac{7}{16}$ inches) x 22 mm. ($\frac{7}{8}$ inch).
33 mm. ($1\frac{3}{16}$ ") x 23 mm. ($\frac{7}{8}$ ").
34 mm. ($1\frac{3}{8}$ ") x 22 mm. ($\frac{7}{8}$ ").
36 mm. ($1\frac{7}{16}$ ") x 22 mm. ($\frac{7}{8}$ ").

In all these eleven eggs the usual shape is elliptical with blunt, rounded ends. In the first and second sets, one egg is much more elongate and one end more pointed than the other. This tendency toward the ovoid form also comes in the third set, where development has progressed and the increase in size has been in girth. All these eggs when laid are white with tough, coracious shells which are covered with small crystal-shaped or cup-like granules. These make the egg quite distinctive.

6. Elaphe guttatus (Linn.): Corn Snake; Rat Snake; Chicken Snake; Red Chicken Snake; Mouse Snake; House King Snake; House Snake; Spotted Snake; Spotted Racer; Spotted Coluber; Red Coluber.

Only two specimens (Nos. 6,229, 6,230) were taken July 15–November 1, 1912, after our departure. Beyer[31] thinks of them as fairly common in pine-wood regions, but says, "It is not found in the swamp lands, being strictly terrestrial in its habits." Certainly, this form must have travelled through swamp to reach Billy's Island and doubtless encounters moisture enough on the islands.

Coloration.—This beautiful snake is light red or ashy-gray, with a series of dorsal dark red, crimson or brick-red saddles or transverse bars. These are 3–5 scales wide, occupy from 10–13 rows and have dark-edged borders. On one specimen there are 50 in all, 36 before the vent and 14 beyond it; in the other, there are 41 blotches, 29 before the vent and 12 beyond it. On either side appears an alternating row of smaller dark-bordered red spots. Anteriorly, these

[31] Beyer, Geo. E. La. Herpetology, *Proc. La. Soc. Naturalists*, 1897–1899, New Orleans, 1900, p. 39.

become very narrow and the elongate black borders constitute most of the spots. The third row on the first four rows of scales only shows distinctly in the anterior region. The venter has a tinge of the color of the back, but appears to be mainly white or yellowish-white, tessellated or checkered with quadrangular black spots. In markings of the head these specimens very well agree with *Elaphe guttatus guttatus*.

Dimensions and Variations.—These two specimens are, respectively, 97.3 and 111.8 cm. long; the tails, 16.2 and 18.7 cm., or 6 in the total length; the gastrosteges are 218, 227; the urosteges, 69 and 68; anal divided; the scales are 24–27–18 and 23–27–19; the oculars 1–2; the temporals 2–3 (4) and 2–3; the supralabials 8; the infralabials 11 and 12.

Food.—This species belongs to the group known as rat snakes, and each specimen proves true to racial reputation. In the stomach of each we found a full-grown rice-field rat (*Oryzomys palustris*) and other remains. Both of the rats had been swallowed head first, and we firmly believe them to have been taken alive. This requires considerable dexterity in nature where the prey is not cornered and may also be another bit of evidence to show this species more aquatic than usually thought. No parasites were found in the alimentary tract of either specimens.

7. **Elaphe obsoletus** (Say): Pilot Snake; Chicken Snake; Spotted Chicken Snake; Gray Coluber; Gray Rat Snake. Fig. 9.

Six specimens of this puzzling form were taken, and we regret this series is not larger. However, this small collection confirms us in the belief that *Scotophis confinis* B. and G., *Coluber obsoletus lemniscatus* Cope, *Coluber spiloides* Dum and Bib., possibly *Scotophis latus* B. and G., and *Coluber quadrivittatus* Holbrook are individual variations of *Elaphe obsoletus*. This conclusion in its main features is in agreement with Boulenger and Rhoades and partly in accord with Hay's and Brown's diagnoses of these forms of the genus *Elaphe*.

Coloration.—The ground color of the specimens is an ashy-, brownish- or yellowish-gray with a series of 30–36 dorsal grayish-brown to dark chocolate-brown spots on the body and 9–16 on the tail. In the cephalic half of the body these spots have their anterior and posterior edges concave, *i.e.*, their angles produced, thus giving the spot the shape of a ray's egg; in the caudal part of the body the dorsal spots are more or less quadrate. Occasionally, the 1st and 2d or the 2d and 3d dorsal spots are more or less united. In one specimen for its entire length (No. 6,136) these dorsal spots are connected

at the angles by a longitudinal stripe on each side, as in *Coluber obsoletus lemniscatus* Cope. The dorsal spots are 3–4 scales long and cover 8–10 rows of scales. On the 2d–6th rows occurs a lateral row of spots which alternate with the dorsal spots. In the anterior region they become very elongate and linear. In No. 6,136, with two faint dorsal longitudinal bands, this lateral row is connected by a longitudinal band on each side, the band obscuring the spots in the caudal half of the body. Thus, in this specimen, we have the four bands of *C. quadrivittatus*, but the spots of *C. spiloides* or *C. o. confinis*, in other words, a good *C. o. lemniscatus* Cope. To add to the confusion, the temporals on one side are 2–3–5 while on the other side they are 2–1–2. Beneath the lateral row of spots occurs another row just above the gastrostegal keel of each side. Each of these spots is opposite a dorsal spot and occupies the first row of scales and the ends of 2 sometimes 3 gastrosteges down to the gastrostegal keel. Sometimes, however, this lowest row of spots does not alternate with the lateral row and sometimes this lowest row is obscure. The venter in the large specimens is yellowish-white or straw-color (most yellowish in the *quadrivittatus-lemniscatus* specimen), while the two smallest specimens have it whitish or ashy-white. In some, irrespective of size, the venter in the cephalic fourth or fifth of the body is immaculate, while in others it is with spots like the ground color of the dorsum; the venter posteriorly may be almost solid in color like the dorsum. In some, the chin and throat area may be immaculate yellow, yellowish-white or white or the gulars may be slightly grayish. In all the infralabials have black borders as have the supralabials, but the intensity of this color varies. Two specimens have no postocular band at all, one of the smaller ones has it indistinct, another has it on one side and absent on the other and two have it very prominent. Only two have the darker black prefrontal cross band (on posterior margins). The presence or absence of head bands in this assemblage of snakes is too variable and individualistic a character to be of much weight in separating species. Some of our specimens have the head uniform like the body color; others are with distinct head bands.

Dimensions and Variations.—The six specimens vary in length from 68.7–144 cm., the tail from 12.8–27 cm. or 5.0–6.2 times in the total length. The gastrosteges range from 231–243, or average 236; the urosteges are 71–92 or average 85; anal divided, in No. 6,135 entire; the oculars are 1–2, except in No. 6,135 where 1–2 and 2–2, the upper preocular coming from the forward part of a normal

supraocular; supralabials 8, except in one specimen where 8 on the left side and 9 on the right side; eye resting on the 4th and 5th supralabials; infralabials 11 or 12; temporals variable, in three specimens 2–3 as in *C. spiloides* Dum. and Bib., in one 2–3 on one side and 2–1 on the other, in another 2–3 and 2–4, in a sixth 2–3 and 3–4, the last a duplicate of Cope's figure 196, p. 851, for *C. lactus* B. and G., and, strangely enough, the 2–3 condition barely escapes being 1–2; in fact, in just these six specimens on one side or on the other we practically have duplicates of the temporal scutellations of Cope's figures 191–196, namely, for *C. rosaceus, quadrivittatus, spiloides, obsoletus obsoletus, obsoletus lemniscatus,* and *lætus*—rather too strong an individualistic a variation in a localized collection of six to make it a stable and cardinal character of primary dictinction.

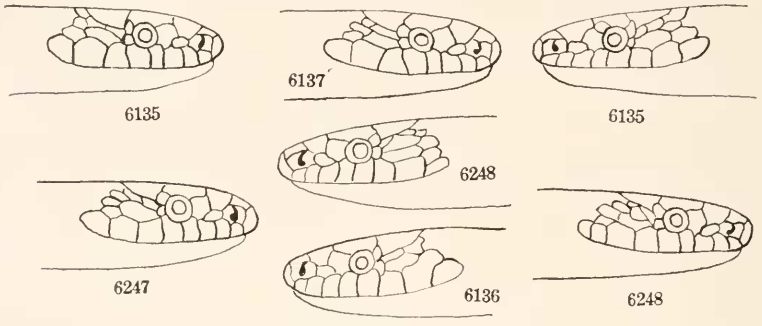

Fig. 9.—*Elaphe obsoletus* (Say).

The scale formulas are 29–29–19 for two specimens, 29–27–19, 27–27–19, 26–29–19, 25–27–17; from 9–23 keeled rows of scales; anterior chin shields touching 4th and 5th infralabials.

Our specimens agree best with *Coluber spiloides* Dum. and Bib., although equally well with *C. obsoletus confinis* if Cope's first temporal scale be considered abnormal for this form. One specimen seems a good *C. obsoletus lemniscatus,* if not more than an incipent *C. quadrivittatus.* All in all, if the supposed diagnostic characters of these four break down in a collection of six snakes from one isolated environment, one must question the weight to be attached to such distinctions.

Habits.—This agile and slender snake is the most arboreal snake of the swamp. Its compressed body with the gastrostegal keels on either side where the sides abruptly meet the venter suggests an arboreal form and its habits confirm the belief. This species was

found along the water courses near Billy's Lake. Here they climb up the bushes and small trees which skirt some of the streams of the swamp. Our first specimen was 6 feet up above the water, and they have ascended 10 or more feet in our few experiences with them. They are probably far more common than our collection might imply, but their position, the cover of the dense herbage and the color of the body, all make them rather difficult to find.

Breeding.—This is an ovoviviparous snake and three specimens taken June 1, 3 and 15, 1912, had the eggs quite immature. One had 18 on the left side and 15 on the right side; another had 14 in all, 8 on the right side and 6 on the left side.

Food.—No doubt this form secures much of its food in the bushes and trees it so commonly frequents, and true to the reputation of *E. obsoletus* of the north this Okefinokee representative proves an enemy of the birds. The natives steadfastly held that it ate birds' eggs and young. One specimen had partaken of some kind of eggs and a second individual had birds' feathers in its stomach. A third snake had eaten the pine-wood's tree frog (*Hyla femoralis*). This species also frequents the islands and feeds on the ground. Here they do damage to the ground-nesting birds, as many of the other species of snakes do. They also often enter poultry yards for rats and mice as well as the hens' eggs. One of the native boys brought us a pilot snake which he claimed was caught in the act of swallowing a hen's egg, and stomach contents substantiated his claim. They report that they have taken some which had eaten as many as ten at one time. None of these six snakes had parasites.

8. Lampropeltis doliatus coccineus (Schlegel): Scarlet King Snake; Red King Snake; "Coral Snake." Fig. 7.

Six specimens of this fine, beautiful snake were taken on Billy's Island. The nearest records are from Fernandina, Fla. (C. F. Batchelder), and from Gainesville, Fla. (J. Bell). Each of these Cope accredits to the form *Osceola elapsoidea* Holbrook.

Coloration.—Ground color scarlet (fainter below) covered with 14–20 pairs of black rings on the body from head to anus and with 3–6 pairs on the tail. These rings inclose white or yellowish intervals, which are 1–1½ scales wide on the dorsum and 2½–3 scales wide on the side, the black rings themselves each being 2–4 scales wide. In only one specimen, No. 6.240, do the rings completely and perfectly encircle the body for its entire length, and, in the caudal region, the abdominal white interval has a black spot between the black rings. In the other specimens the rings just fall short of meeting each other

on the venter and sometimes their ends alternate. Frequently, the black bands of a pair have their ends uniting with each other and not with opposite ends. Occasionally the process goes farther and on the sides a black bar extends from one black band to another across the white interval and we have part of a white interval completely encircled by black dorsally and ventrally as well as on the sides. The black band on the neck is not complete on the ventral side in any of the six individuals; ahead of it, comes a white or yellowish-white interval, narrower on the dorsum but wider on the sides where it extends across the angle of the mouth onto the upper posterior labials and on the lower surface of the head. The black occipital bar in one specimen is limited to one occipital; in the others it generally reaches to the temporals and the posterior edge of the frontal and the supraoculars. In one specimen there is a black band back of the eye, and in another the occipital black bar covers the occipitals, most of the frontal, all of the supraoculars, postoculars and 1st temporal and the upper surface of the two posterior supralabials. Sometimes the supralabials near the eye and rarely a few infralabials immediately below may have dark margins.

Dimensions and Variations.—The total length varies from 23.7–57.6 cm.; the tail, 3.4–8.9 cm. or 6–7.2 times in the total length; the gastrosteges are 172–189; the urosteges 39–48; anal entire; the supralabials 7; infralabials 8 except on one side of No. 6,240, where there are 9; the oculars are 1–2.

From a study of these six specimens from one locality we were led to conclude that *Lampropeltis doliatus coccineus* and *Osceola elapsoidea* were the same form, and this conclusion came independently of the previous judgments of Brown, Brimley and others. Brown says,[32] "the head plates and scales are becoming variable, specimens being found without a loreal and with the scales reduced to nineteen rows. This extreme reduction is *Osceola elapsoidea* B. and G., and is not common, but intermediate stages are frequent; out of some thirty specimens colored as in *coccineus* I have met with two without a loreal and with 19 rows. The case is peculiar. If constant, the distinction would be a generic one; on the other hand, the importance of the character involved would seem to lift it out of the ordinary category of intergradation, for we apparently have a subspecies being transformed under our eyes. On

[32] Brown, A. E. A Review of the Genera and Species of American Snakes North of Mexico, *Proc. Acad. Nat. Sci. Phila.*, LIII, 1901, p. 74.

the whole, it may accord best with a sound method to take no note of this form at its present stage." C. S. Brimley says that in his experience "the normal formula is, scales in 19 rows, occasionally 17 or 21, one temporal in first row, occasionally two, and loreal usually present, but sometimes absent on one or both sides."[33] Only in his Florida specimens were the scales in 17 rows. Like these, our specimens have a greater reduction in number of scale rows than Cope's material, the formulæ being 17–15–15, 17–19–15, 17–19–15, 17–19–17, 17–19–17, 17–19–17. This is a reduction far beyond the 21 rows of Cope's and Brown's descriptions and if anything below the better normal of Brimley. So, in this respect, our specimens incline towards *Osceola elapsoidea*. Furthermore, only in the specimen (No. 6,100) with this reduction carried farthest (17–15–15) do we have the loreals of both sides absent, but it is one of the largest of the six specimens. In this individual the prefrontal has descended to the level of the labial and in the forms (*L. d. coccineus*) with loreals these plates must be derived from the prefrontal. In No. 6,242 the loreal is very small and linear, while in No. 6,240 it is normal and quadrangular on one side and triangular on the other, the apex not even touching the preocular. In 3 specimens (Nos. 6,101 the smallest, 6,241, 6,249 the largest) the loreal is present on both sides and a prominent quadrangular plate from the preocular to the nasal.

Habits.—This species is more or less of a burrower, but a glance at some of the largest specimens suggests *Elaphe* snakes in their compressed deep bodies with sides sharply defined from the venter by a ridge. Such elaphine snakes climb well and of such evidence in *L. d. coccineus* we have only the capture of a snake taken June 6, 1912. It was found on one of the frames of an old building, the snake being $3\frac{1}{2}$–4 feet above the ground.

Food.—In food habits this species is more or less of a constrictor. It feeds on ground lizards, skinks, swifts and other snakes and insects. In the stomach of No. 6,242 we found an angleworm and the remains of two killifishes, suggesting more of any aquatic nature than usually ascribed, but after every rain Billy's Island is covered with little water pools containing fish which as evaporation goes on become stranded. Such would be easy of capture. Our specimens yielded no clue to the oviparity or breeding of this species.

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[33] Brimley, C. S. Notes on the Scutellation of the Red King Snake, *Ophibolus doliatus coccineus* Schlegel, *Jour. Elisha Mitchell Soc.*, XXI, No. 4, December, 1905, pp. 145–148.

9. **Lampropeltis getulus getulus** (Linn.): King Snake; Common King Snake; Chain Snake; Thunder Snake; Thunder and Lightning Snake; Wamper; Wampum Snake; Rattlesnake Pilot. Plate 111, fig. 2; fig. 10.

Thirteen specimens of this fine snake were taken and many more seen. It is common throughout the drier parts of the swamp and frequents the outskirts of the swamp as well. It keeps to the islands and none were taken in other situations than the saw palmetto or heath societies of the piney woods where it courses through the low cover after its living prey or eggs. Okefinokee swamp comes within the supposed range of *L. g. getulus* and is considerably east of Louisiana where *L. g. sayi* is recorded. The nearest records of *L. g. getulus* are from Fernandina, Fla. (C. F. Batchelder), Gainesville, Fla. (J. Bell), and Nashville, Ga. (W. J. Taylor).

Coloration.—Most of the specimens at hand vary from a light to a deep brown. Five are shining blackish-brown in body color, but these are among the smallest specimens of the collection. All thirteen have white or yellowish cross-bands which may be from 23–25 in number on the body proper, rarely as low as 18, and from 5–10 on the tail. Often these bands are incomplete and appear only on one side with none corresponding on the other side, and frequently in such specimens the cross-bands may be diagonal—not strict cross-bands; in many of the specimens the bifurcations on the sides are absent and the cross-band scales of the dorsum have dark body color tips which at times so blacken the scales as to interrupt the bands completely. In one specimen the band was very indistinct. These bands are normally $1\frac{1}{2}$–2 scales wide on the dorsum or rarely 2, rarely 3–5 scales wide on the sides where the bands bifurcate bordering a spot of body color. These lateral spots alternate with similar dorsal areas and are from 3–7 scales wide and occupy the lower 2 or 3 rows of scales as well as the ends of 3–5 gastrosteges. The dark dorsal areas are 7–10 scales wide; in some they are a beautiful shining black or deep brown; in two or three of the specimens each scale of the cephalic half of the body has a pale central spot; in three specimens with shining black body color the first four to six dark areas back of the head had patches of scales with white centres as conspicuous as the cross bands themselves (suggestive of *L. g. splendidus*); finally one brown (No. 6,218) king snake has all the scales with every centre of the same intensity of color as the conspicuous cross-bands (very suggestive of *L. g. sayi*). The venter is of the same color as the cross-bands and is heavily blotched with black due in part to the extension of the lateral spots on the gastrosteges. All the head plates are conspicuously marked with white or yellowish

spots, particularly so in No. 6,218. The three subspecies *getulus*, *sayi* and *splendidus* intergrade so imperceptibly and specimens from one region sometimes reveal all the supposed distinguishing characters.

Dimensions and Variations.—These specimens vary from 67.6–144.4 cm. (2 ft. 1 in.–4 ft. 9 in.) and the tail from 9.1–19.3 cm. (7.4–9 in the total length); the gastrosteges are 214–223 or average 218; urosteges are 41–54 or average 49; the scales are 21–21–19 in eight of the specimens and the other formulas are 21–23–19, 22–21–19, 23–21–19 twice, 23–23–19; the oculars are 1–2; supralabials 7; infralabials 9 or 10; temporals may deviate from 2–3, the formula for ten specimens, one specimen has them 1–3, another has 2–2 and a third 2–3 on one side and 2–4 on the other; the loreal is present in all and in No. 6,218 (*sayi*-like specimen) there are two on the left side. The anal is entire, in No. 6,139 it is entire, but the gastrostege ahead is divided and in No. 6,140 the anal plate is divided into three parts.

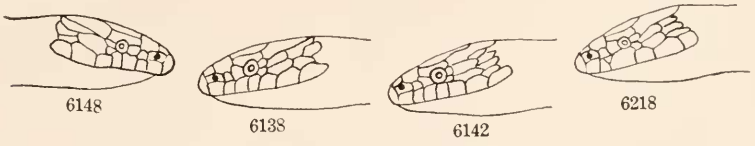

Fig. 10.—*Lampropeltis getulus getulus* (Linn.)

Habits.—This species is one of the most strikingly marked snakes of the swamp. The shining black or brown with the contrasting white or yellow cross-bands makes its appearance very attractive. In nature, it is mild, proves an interesting and safe pet, and in no instance during our stay in the swamp did it display any tendency toward belligerency or sullenness toward any member of the party.

Food.—The natives recognize its good nature and consider it harmless, though the king of the snakes. They are aware of its usefulness as an enemy of moccasins and rattlesnakes and report several combats which always resulted successfully for the king snake, but these unlettered people, unlike many sentimental writers, do not hold that the king snake deliberately searches for the poisonous snakes in particular. We, as they, believe it the enemy of every species of snake in the swamp, preying of course more on the terrestrial species of its own haunts. All the smaller snakes suffer, and of the larger species, the blacksnake and spreading adder are the commonest prey. It is surely a good "pilot" to the naturalist

whenever one finds it digging, for it almost invariably means other snakes, eggs or some good capture. It will seldom fail to react per schedule if you loosely hold it in one hand and a live blacksnake in the other. Almost before you can predict the outcome, the former may be far within its captor—a demonstration we have tried more than once in the field. It is especially fond of young snakes. One of our specimens had taken a newly hatched *Heterodon* and the natives recounted several occasions when they had found it working beneath a log for what proved a brood of young snakes. We do not doubt but that it feeds on mice, rats and other small mammals, but of such evidence we found little in the swamp. Possibly, in early spring or in the fall these are more its reliance. The principal food of this species is turtles' eggs, with snakes or their eggs a second choice. Four of our specimens had eaten Florida cooters' (*Chrysemys floridana*) eggs which they dug out of the sand and two had mud turtle (*Cinosternum pennsylvanicum*) eggs in their stomachs. Mr. Francis Harper tells us that he and David Lee almost stepped on a king snake. After their recovery, what should they find but a *Kinosternon* digging in sand probably preparatory to laying and the king snake was close at hand. In fact, so addicted are they to this egg diet, that the natives consider that it is a common happening to find the snake awaiting the egg deposition. Unless it be the Florida bear, there is no form in the swamp which eats turtles' eggs in such quantity as the king snake. It will take a whole nest of eggs at one time, as many as 14 being found in the stomach of one snake.

Breeding.—Of the breeding habits of this species we have a few scant notes. Mr. Harper reports a pair of them mating on May 19, 1912, and says another king snake was watching the pair. One of our specimens (No. 6,145), taken June 13, 1912, had 7 fair-sized eggs. Only one of the specimens had parasites, and this had two large parasitic worms 30 mm. long fastened to the outside of the esophagus and lying in the body cavity.

10. Cemophora coccinea Blumenbach: Scarlet Snake; "Coral Snake"; Red Snake. Plate III, fig. 3.

One specimen of the scarlet snake was captured on Billy's Island by one of the native boys. This appears to be one of the rarer snakes of the swamp, six of the scarlet king snakes being taken to the lone one of this species. This species extends from Maryland to Florida and westward to the Mississippi Valley.

Coloration.—The color of the back is a salmon-pink, brighter

anteriorly; the back and sides with 20 pairs of black half-rings, the first on the head, the 16th just back of the anus and the last two rather indistinct. The black half-rings are widest dorsally, on the sides the black rings of a pair approach each other soon to diverge again as the 4th–2d rows of scales are reached. An irregular black spot on the 1st row of scales at the lower end of each white interval sometimes unites the ends of two half-rings; bands between half-rings ivory-white with very fine dots all over the scales. Width of each black half-ring usually two scales, but one scale wide half way down the sides; the interval usually three scales wide. The first black band narrow and extending from 1st temporal along the anterior margins of the occipital plates to the 1st temporal of the other side. First temporal may be entirely or half black. The gastrosteges almost entirely free of markings.

Dimensions.—The total length is 36.4 cm.; the tail 5.4 cm. or $6\frac{3}{4}$ in total length; the gastrosteges 169; urosteges 19; anal entire, but a half gastrostege ahead of it; temporals 1–2; the nasal divided below nostril; supralabials 6, eye resting on the 2d and 3d supralabials; infralabials 7; loreal point almost enters eye's orbit on the left side, but is more remote on the right side.

Breeding.—This specimen, taken June 20, had three white eggs which were very elongate and with thin membranous integument. They were, respectively, 34, 35, 35 mm. long.

11. Tropidonotus taxispilotus (Holbrook): "Water Moccasin"; Pied Water Snake; Brown Water Snake; Water Rattle; Water Pilot; Aspic.

Only eleven specimens of this species were taken, yet it is common along Billy's and Minne's Lakes, Log River and all the more open water courses. It was not far from the Okefinokee Swamp that Holbrook secured one of his two specimens for his original description, namely, from Altamaha River. The natives were not anxious to help us in the captures of this species.

Coloration.—The coloration is a light chocolate- or reddish-brown, sometimes rusty with a series of three rows of large subquadrate or rectangular spots, the dorsal row varying from 23–27 dark brown or black spots before the anus and 15–18 behind the anus, the averages being 25 and 16, respectively. Anteriorly, the spots are 3–4 scales wide and posteriorly 2–3 scales wide. In transverse width the larger spots cover 8–10 rows of scales. Alternating with the dorsal spots is a row on either side. These spots cover from the 1st to the 10th row of scales. Normally, the lateral and dorsal spots do not touch as the descriptions assert, but in almost every specimen one or two

sets, particularly in the middle of the body, are connected by a black line 1 scale wide. The venter is white or yellowish. Holbrook's description, "Most of them (gastrosteges) with a black spot at either extremity and the centre dotted minutely with black," applies to some of the younger specimens very well, and in almost all the older individuals the same coloration can be discovered, namely, two rows of squarish black blotches with a dusted lighter line down the middle of the belly. Rarely, the black obscures all semblance of pattern. The gular gastrosteges usually are without the lateral spots and the whole anterior edge is black bordered; the head is like the body in color; the lower labials have a fine dusted appearance.

Dimensions and Variations.—The specimens vary in length from 63–130.5 cm., all except four being over 100 cm.; in the largest specimen (130.5 cm.) the tail is 30.5 cm. long and the tail is contained in the length in the eleven specimens from $3\frac{4}{5}$–$5\frac{1}{4}$ times, 4 or $4\frac{1}{2}$ being the normal. The gastrosteges are 130–142 or average 135; the urosteges are 62–70, the average 67, far below the 70–90 of Cope and Brown. Anal plate usually divided; in three specimens with a half gastrostege ahead of it and in one or two a whole gastrostege divided, otherwise this plate anterior to anal plate is entire; in No. 6,111 the anal is entire and in No. 6,224 it is also entire with a faint transverse median furrow extending halfway backward toward the anus. The scale rows are far below 31–33 rows, the combinations being 27–27–21, 28–28–22, 29–31–22, 29–29–21 twice, 29–30–23, 29–30–22, 30–30–25, 30–29–22, 30–28–23, 31–31–21 or in the middle of the body from 27–31—not 29–31 or 31–33 as discovered in other members of this genus. In fact, only two have 31 and only three 30 in the middle of the body. The oculars are 1–2; the supralabials 8, the eye resting on the 4th, except in rare cases when over the 4th and 5th; the infralabials 10–12; temporals 2–4 in eight instances, 2–5 in six and 2–3 in three cases.

Habits.—This snake is par excellence the snake of the open water courses in the swamp or narrow runs just wide enough for a boat. Either along Log River or Minne Lake Run one can hear a succession of pied water snakes as they drop off into the water. They may climb upon the dead branches or live shrubs which line the water courses or rest on the little islets or verdant hummocks where many an individual is hidden. Particularly does one find them in the latter situations on the hottest days, and not infrequently we have approached close enough on such days to club them. As they

shoot into the water sometimes the pied belly reveals that it is *T. taxispilotus,* and not *T. fasciatus* or any of its subspecies.

The pied water snakes are very large and in general very shy and elusive. We had been in the swamp for $2\frac{1}{2}$ weeks before we captured our first specimens, although some of us passed them daily. At first we had to shoot them as they rested in the open on branches 2–$3\frac{1}{2}$ feet above the water. Then their capture was not always certain, for we often lost them because of our caution in landing them. The natives are afraid of them, and whoever has wounded or had experiences with this species in its wild state knows they are vicious and belligerent when hard pressed. The natives call them "water moccasin" and consider them as poisonous as rattlesnakes or true moccasins. Once when one of us was bitten by a medium-sized specimen the Lees awaited the result with considerable solicitude for the supposed unfortunate. After two weeks of attempts, we were growing impatient because we had taken none of the largest individuals, and "Alligator Joe," one of the visitors, when fishing, stunned a "water moccasin" and considerately put it in the prow of his boat. We had almost reached him when the snake revived, and in the twinkling of an eye he had thrown his present into the lake with his oar. Man and live "water moccasin" in the same boat was not conceivable. And there is plenty of reason for *our* common respect for this large water snake, which reaches 5 or barely 6 feet. The largest specimen secured measured $4\frac{1}{2}$ feet. Several specimens in hand measure in girth from 7–8 inches, and we are positive we have seen individuals with a circumference of 10–12 inches. Especially is this true of the females as the embryos develop. Then the skin is so distended that $\frac{1}{16}$ to $\frac{1}{8}$ of an inch or more separates each of the scales.

Breeding.—This species is ovoviviparous. The specimens taken in the middle of June showed the developmental stages little advanced. One specimen (No. 6,113), 2 feet 10 inches long, had only 14 embryos, while another, $4\frac{1}{2}$ feet long and about 8 inches in circumference, had 40 embryos. It is rather a significant fact that all the larger individuals taken are females. Either the large males were too fast for us or the females are larger or occupy more exposed positions and may prove more sluggish or braver. The individuals taken from July 15–November 1, 1912, showed the embryos much farther advanced and some had unborn embryos 26 or more cm. long. One specimen (No. 6,256) had 58 embryos, 32 on the left side and 26 on the right side. The normal number seems to be 35–40 embryos.

Food.—This animal will eat almost any animal which it finds in the water or above it, provided it can swallow or capture it. One specimen (No. 6,116) had two frogs (*Rana sp.*) in its stomach; another (No. 6,260) had a small warmouth (*Chænobryttus gulosus*) and a third had other fish remains which were not to be identified. Five of the individuals had internal parasites in the stomach, or about $\frac{1}{7}$ of all the snakes so troubled were of this species.

12. Tropidonotus fasciatus (Linnæus): "Moccasin"; "Water Moccasin"; Southern Water Snake; Banded Water Snake. Fig. 11.

Ten snakes not of *T. taxispilotus* were taken in the swamp. These are so variable in coloration and also in scutellation that we hesitate to add to the confusion which obtains in the interpretation of the *fasciatus* group. Many varieties, subspecies, geographical races, forms or phases have entered the literature of North American Natrices, and these are based mainly on temporal and ocular scutellation, number of scale rows and coloration. These cannot all be assigned faunistic or geographical areas and most of them are as yet likely to appear in one region if a large series be taken. The group is very variable and some of the forms designated may be variants struggling to assume a stable varietal form or geographical place. As yet, however, this gamut of variation apparently appears independent of geographical environments and is almost possible if not actually existent in one region. Therefore, the safer and more conservative course is to place them together and not take any *Cratægus* course until more certain of our ground. Intensive localized study and possible breeding as well as extensive geographical collecting with few personal equations seem the hopeful solution of the question.

Coloration.—The smallest specimen (No. 6,227) in coloration is *T. rhombifera* Hallowell. There are 32 dorsal diamond-shaped rhombs from the vent forward. These are formed by oblique bars which connect the upper angles of the lateral row of spots with the alternating dorsal row. The species *T. rhombifera* is considered to be a Mississippi Valley and Texan form, yet this specimen certainly accords with Cope's and Brown's descriptions of *T. rhombifera* and Ditmar's figure of it. Cope held that it rarely had 25 scales, but Brown finds that more than half of his specimens were with 25 rows, and we firmly believe 23 not out of the range of this color variation. Thus, its limit clearly overlaps the supposed 23–25 range of *T. fasciatus*. The specimen at hand has 23–23–18 scales. The venter has each gastrostege yellow with the border black. Posteriorly, each urostege is black-bordered, thus giving two rows of yellow spots,

and the under surface of the tail consequently looks darker than the anterior ventral region. These black borders unite on either end of the gastrostege and thus enclose a transverse elliptical central area of yellow. Also along each end of the gastrostege opposite the lateral spot of the side the gastrostegal black border encloses another small area of yellow. Thus, we have a central row of transverse yellow gastrostegal spots and a row on either end of smaller encircled yellow spots, very much like the venter of *T. compressicaudus* Kennicott (see description Brown, p. 34). This species is Floridan and might enter the Okefinokee. Furthermore, *T. compressicaudus walkeri* has 23 rows of scales as has our specimen. Finally, our specimen (*rhombifer*-like on dorsum except for the neck) has on the neck four black longitudinal bands, the two of either side being connected posteriorly. The labials are yellowish with dark borders. There are no bands on the head. Many of our specimens—in fact, practically all—have the tail quite strongly compressed at its base and heavily carinated, and an examination of supposed *T. f. erythrogaster*, *T. f. transversa*, *T. cyclopium* and *T. rhombifera* material from other localities does not impress us that this relative character is sufficient to set *T. compressicaudus* apart as a separate form from *T. fasciatus*. Eight of the ten specimens have no more than 23 scales, and always this number in the middle of the body; three having 23–23–19, two 23–23–17, one 23–23–18, one 23–23–20, and one 21–23–19. Some of these may well be *T. f. pictiventris*, and were so identified in the field with only Cope's work at hand. This form he restricts to Florida, and he has specimens from Gainesville and Palatka, not far from the Okefinokee. He considers it close to *T. compressicaudus* in coloration of the belly. But some of our specimens clearly have the *compressicaudus-pictiventris* coloration to which there is added the reddish abdominal spots of *T. fasciatus fasciatus*. One specimen (No. 6,228) has no lateral or dorsal spots apparent, the belly an immaculate salmon-pink, except under the tail where a bluish-gray enters, and the scales strongly carinated—all characters of *T. fasciatus erythrogaster*. Some specimens show the lateral space with reddish or reddish-brown of *T. fasciatus fasciatus*. Some of the ten showed the yellowish labials with strong black borders and most of these individuals have the two light dots close to the suture of the occipitals. One specimen (No. 6,119) is a uniform grayish or greenish-brown on the back including the head which has no postocular band, and the belly is whitish or yellowish-white with hardly any suggestion of gastrostegal borders (faded-out brown). Another very large speci-

men with a few reddish bars evident on the sides has a yellow venter with black gastrostegal borders not strong, but on the end of each gastrostege the blue-black of the back encroaches for $\frac{1}{2}$–$\frac{3}{4}$ of an inch and makes a striking lateral border for the yellow of the middle of the venter. Finally, we have another specimen (No. 6,231) with scales 21–25–21 and dorsum grayish-black above. The only marks evident are transverse white dorsal bands $\frac{1}{2}$ scale wide which become less distinct as the belly is reached. The entire underparts are grayish-white with gastrostegal borders grayish-black. These borders surrounding the urosteges make two rows of encircled spots on the under surface of the tail. It is, we believe, a *T. fasciatus*, yet far from the ordinary coloration.

Dimensions and Variations.—These specimens vary in length from 28–118.7 cm., the tail from 7.9–29 cm., or 3.5–4.5, average 3.7 in the whole length; gastrosteges are from 123–133, the urosteges

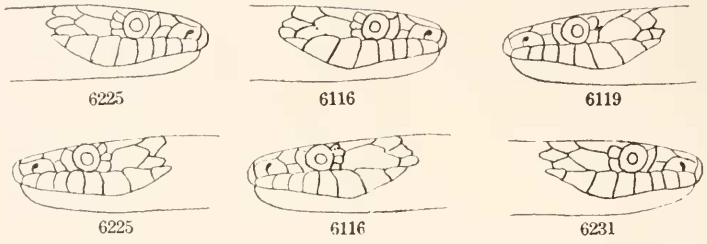

Fig. 11.—*Tropidonotus fasciatus* (Linn.).

from 67–85; supralabials 8; infralabials 10, rarely 11, sometimes 10–11 as in two specimens or 11–12 as in one; the temporals are 1–3 in seven specimens, in one of which on both sides the first temporal has captured the normal third temporal of the second row; in No. 6,118 the temporals are 1–2; in No. 6,226, 1–2 on the undestroyed side; in No. 6,225, 1–3 on the right side and 1–2 on the left side. The oculars are 1–3 in eight specimens, but one of these (No. 6,116) has the upper and lower postoculars with a strong start towards subdivision, which if completed might give 5 oculars in all; in No. 6,119, the oculars are 1–2, and No. 6,231 on its undestroyed side has 1–2. Thus, we see in ten specimens a strong tendency for the temporal and ocular formulæ to vary. The published evidence and material at hand at the present date is not sufficient to determine whether *T. compressicaudus* and its subspecies, *T. bisectus*, *T. fasciatus* and its subspecies and *T. rhombifera* are other than of the *T. fasciatus* assemblage, and thus we would be inclined to treat them

until the group is very carefully collected, bred and studied from a large series from several of their supposed geographical habitats.

Habits.—This species was not so common as the pied water snake. Like it, however, this snake is called "water moccasin" by the natives who fear it. One evening, one of us accidentally punctured his thumb on the teeth of a recently killed snake of this species. The next morning several of the native family very concernedly wished to see how bad the thumb would be. Unlike the pied water snake, it is fairly common on the water prairies and about the edges of the islets ("houses" or "heads") of the prairies. We also took this species in the water ditches on the outskirts of the swamp and along the lumber railroad ditches. We were unable to find a single snake of this species along the larger water courses where the pied water snake apparently replaces it. It seems to be more a form of the moist situations on the islands and possibly in the wooded, swampy parts. In disposition it is like other water snakes, but is a poor second to its relative, *T. taxispilotus*, in pugnacity.

Food.—It feeds largely on aquatic animals. One specimen (No. 6,116), taken May 30, 1912, had two frogs of the most aquatic species of the swamp (*Rana sp.*) in its stomach and two (Nos. 6,231 and 6,115) had taken a southern meadow frog (*Rana pipiens sphenocephala*). Only one of the ten had parasites in its stomach.

13. Storeria dekayi (Holbrook): DeKay's Snake; DeKay's Brown Snake; Little Brown Snake; Brown Snake; Ground Snake; Spotted Snake; Spotted Adder; Brown Grass Snake. Fig. 12.

Two specimens (Nos. 6,237, 6,239) were secured between July 15 and November 1, 1912, by Mr. Jackson Lee, of Billy's Island. This form and its congener, the red-bellied snake, are commonly associated with dry grounds, but certainly at some seasons within the swamp it must find it impossible to find such a habitat, and it may be less averse to wet situations than once thought.

Coloration.—Both specimens have the usual grayish-brown or ash-gray on the upper surface with the pale vertebral line bordered by black dots. The venter is white or yellowish-white in alcohol and the row of dots near either end of the gastrostege is present. Besides these, there are finer dots widely separated over the whole belly. The neck has a black band extending from the ends of gastrosteges Nos. 3–5 across the angle of the mouth to the mid-dorsal line where it meets its fellow of the other side. In front of this bar a white band of belly color reaches across the sixth and seventh infralabials and on the sixth and seventh supralabials. The 3d–5th supralabials and the same infralabials are almost entirely black.

Several of the other labials are with large black spots or margins. The dorsal head plates of body color are with a strong sprinkling of black. One specimen (No. 6,239) superficially looks almost as black as the specimen of the red-bellied species did.

Dimensions and Variations.—The gastrosteges were 135 and 138, respectively; the urosteges 62 and 48. The total lengths were 24.4 cm. and 29.3 cm.; the tails 5.8 and 5.2 cm. or $4\frac{1}{4}$ and $5\frac{2}{5}$ in the total length. There are 7 supralabials with the eye resting on the 3d and 4th; the infralabials 7; no loreal; temporals 1–2; anal plate divided, in one specimen with a half gastrostege in front of it. The oculars of No. 6,237 are 1–2 on both sides, but on the right side the preocular is almost divided into two, while No. 6,239 the oculars are 2–2. This character coupled with the scales 15–15–15 in both specimens raises the query whether 15 or 17 rows of scales and 2 or 1

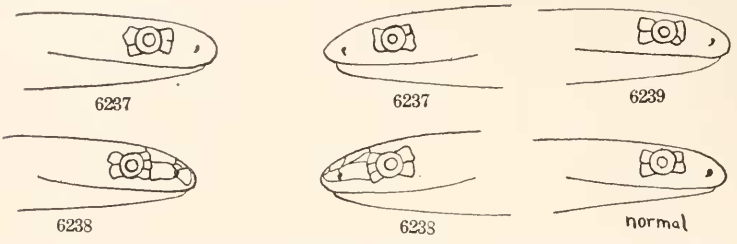

Fig. 12.—Upper figures, *Storeria dekayi* (Holb.). Lower figures, *S. occipitomaculata* (Storer).

preoculars are constant differences between *S. occipitomaculata* and *S. dekayi* as commonly held. Besides, the red-bellied specimen shows greater variation in preoculars by being 3 instead of 2.

Habits.—This species is nocturnal, spending the day beneath logs and stones in rocky situations as well as in meadows. Several times the authors have found it in low fields near a marshy stream.

Food and Breeding.—The DeKay's snake is not wholly insectivorous, as one specimen had 8 gastropods (shells missing) in its stomach. One specimen had 17 small developing eggs, 14 being on the left side. Inasmuch as this was taken after July 15, this would doubtless indicate that this particular specimen of this ovoviviparous species would not have given birth to young until late summer or early fall.

14. **Storeria occipitomaculata** (Storer): Red-bellied Snake; Storer's Snake; Brown Snake; Ground Snake; Storer's Grass Snake.

One specimen (No. 6,238) taken on Billy's Island between July 15 and November 1, 1912, after our departure. This comes well within

the range of the species. This small, largely nocturnal inhabitant beneath stones, logs and other cover usually averages smaller than *S. dekayi*, and our specimen proves smaller than the two specimens of the latter species taken in the swamp. The tail is lost, the specimen measuring 17.9 cm. to the vent. The gastrosteges are 120; scales 15–15–15; temporals 1–2; supralabials 6; infralabials 7. Unlike most of the descriptions, the ocular formulæ are 3–2 for both sides, instead of the 2 preocular condition usually noted. On the right side of the head appears a small supranasal above the nostril and at the common corner of the internasal, prefrontal and two nasals. On the left side is a similar plate not touching the internasal. Other specimens from other Georgian localities (Dr. J. C. Bradley, collector) reveal no such condition, and the present specimen may have had some accident, although it is not especially apparent.

The head in front of the three occipital color spots is much darker than the rest of the body; in alcohol it looks black—in fact, darker than any other specimen of the species we have ever recorded. The characteristic light spot of the fifth supralabial is, however, not wholly obscured. This specimen, like Hay's record, had a slug in its stomach and insect remains in its rectum.

15. Haldea striatula (Linn.): Brown Snake; Worm Snake; Ground Snake; Little Striped Snake. Plate 111, fig. 4.

One specimen was secured on Billy's Island. In the Central States this small snake extends from Minnesota to Texas, while in the Eastern States its range from Virginia southward has not its southern limit well determined. We can find no definite locus beyond W. J. Taylor's (Cope, 1900, p. 1010) record for Nashville, Ga., which is 50 miles northwest of the Okefinokee Swamp. Ditmars[34] gives it as extending to Florida, where it might well be, but in this State Loennberg (1895, pp. 317–339) did not secure it.

Coloration.—The field description of the color of this specimen is as follows: Color of the back with the skin bluish and scales brownish or opalescent; each scale with fine speckings, which sometimes assume a black edge on the cephalic end of the scale. The color of the dorsal scales extends onto the ends of the gastrosteges, fine speckings accompanying it. The gastrosteges are greenish-yellow or opalescent. A pinkish-like area occurs on the side of the head. It crosses the last lower labial, the 4th and 5th upper labials and first temporal and cephalic ends of the second row of temporals. It then fades as it crosses the middle of the occipital plates. The

[34] 1907. The Reptile Book, p. 271.

venter of this adult did not impress us as salmon-colored. The total length is 223 mm. and the tail 34 mm., or $6\frac{1}{2}$ times in the total length. In other specimens from other regions the short tail ranges from $5\frac{1}{2}$–$7\frac{1}{4}$ in the total length. The longest specimen of this species we have seen reached 283 mm. There is no particular deviation from the normal in the scutellation of this specimen. The eye rests on the 4th supralabial and on the posterior end of the third supralabial. The ventral plates are 134, the subcaudals 37.

Habits.—This specimen was found a rod from the thick, swampy cypress edge of Billy's Island. Associated with it was one of the few salamanders found on the trip. The ground was decidedly moist, yet the vegetation was of the pine-barren type. Inasmuch as it was under the cover of a more or less disintegrated log when taken (mid-forenoon), we conclude that it is distinctly a nocturnal form. This specimen had no food within its alimentary tract, but its habitat and previous assertions regarding its food suggest that it feeds on worms, larvæ of insects, etc.

Breeding.—It is well established that this species is ovoviviparous. Hay[35] (p. 397) discovered a female with 5 embryos. Strecker (p. 50)[36] has a specimen with seven embryos, and Ditmars (1907, p. 272) records that a captive "gave birth to seven young on the 20th of August." This lone female, secured June 15, 1912, has six embryos. These masses in length range from 15–18 mm.; in width from 6–7 mm. The membrane about each is practically transparent; the embryo lays in the middle of one side presenting an apparent cephalic and caudal yolk mass which actually on the opposite side proves continuous from one end to the other.

In this species we discovered no parasites, external or internal, and of its enemies know nothing.

16. Thamnophis sauritus sackeni (Kennicott): Southern Ribbon Snake; Southern Riband Snake; Osten-Sacken's Snake. Fig. 13.

Ten specimens in all were taken within the swamp. Its occurrence in Okefinokee Swamp proves interesting in the light of Ruthven's distribution map for this species. He considers it still a question whether this species goes north of the Florida-Georgia line. Of it he writes:[37]

[35] Hay, O. P. The Batrachians and Reptiles of the State of Indiana, pp. 409–610, *Indiana Dept. Geol. and Nat. Resources, 17th Ann'l Rept.* 1891. Indianapolis, 1892.

[36] Strecker, J. K., Jr. Contributions to Texan Herpetology, *Baylor Univ. Bull.*, Vol. XII, No. 1, January, 1909.

[37] Ruthven, A. G. Variations and Genetic Relationships of the Garter Snakes, *U. S. N. M. Bull.*, No. 61, p. 108.

"As at present known, the range of *sackeni* is confined to the southern part of the coastal plain, in southern Mississippi and Florida. This physically recent feature with its low altitude (nowhere more than a few hundred feet above sea level) is characterized by scores of stagnant rivers, lakes, lagoons and swamps. The temperature and humidity are high and the rainfall-evaporation ratio exceeds 110 per cent. (Transeau, 1905). The vegetation is rich, and consists of such forms as white cedar, sweet bay, magnolia, tupelo gum, swamp cottonwood, cypress, *Quercus texana*, etc., in the swamps, and several species of pines on the higher ground. As far as I have been able to find, the form has never been recorded outside of Florida, although Ditmars (1907, p. 219) states that it is distributed in the 'coast regions of South Carolina and Georgia; Florida generally.' Certainly, typical *sackeni* may be expected to occur somewhat north of the latitude of the northern boundary of Florida, but in this general region it comes in contact with *sauritus*, and the status of the two forms in the intermediate region must be examined before the northern boundary of *sackeni* can be even approximately fixed. I must confess to have examined but few specimens from the debatable region, but the fact that *sauritus* specimens from the coastal plain from North Carolina northward show a much closer affinity to *sackeni* than those from central Alabama would seem to indicate that true *sackeni* pushes farther up the Atlantic coast than in the interior, possibly into Georgia and South Carolina, as Ditmars indicates, which might also be expected in view of its more aquatic habits and its association with the coastal plain conditions throughout the greater part of its range."

Coloration.—A color description of a live specimen captured on Billy's Lake is as follows:

The venter is opalescent with an opalescent coppery brown on the ends of the gastrosteges. In water the two lower rows of scales look greenish-brassy and the lateral stripe straw-colored. The row above the lateral stripe is bordered by a line of black specks; the back scales are olive and the dorsal row, much like in color the two lowest side rows, is defined on either side by fine black specks. The dorsal row is practically absent on the caudal two-thirds of the body. Black postocular stripe over the upper labials. Three other specimens in life did not impress us as rich brown or dark as *T. sauritus* and appeared more slender.

Supplementary notes of color from alcohol and formol specimens are: In some specimens, the dorsal stripe extends to a position

opposite the anus; in one individual also along the tail; in most, however, it is prominent only on the neck. Nowhere does it have the color of the lateral stripes except possibly on the neck region. When the body is distended the intervals between the scales have regular light specks or lines as *T. sauritus*. Rarely the lateral stripes become more or less obscure, but not wholly absent. The dorsal stripe covers the median dorsal rows and two half rows and the lateral stripe is on the 3d and one half on the 4th row of scales.

Dimensions and Variations.—The specimens vary in length from 31–71.5 cm. (12½–28 inches). The latter length compares favorably with *T. sauritus* lengths, but the specimens may average smaller than that species, though the average of the ten specimens is 48 cm. (19½ inches). The extreme slimness of the species adds to its diminutive appearance. The tail ranges from 11.2–23.5 cm. in length or 2.9–3.25 (average 3) times in the total length. The gastrosteges vary from 149–159, average 154, where Ruthven's extreme begins and almost coincident with his lower extreme for *T. sauritus*. In all

Fig. 13.—*Thamnophis sauritus sackeni* (Kenn.).

the anal plate is entire. The urosteges range from 95–114, in better accord with the range of Ruthven's *T. proximus* and far below his range for *T. s. sackeni*. The scale formula is 19–19–17, except in one where only 19–17–17 obtains. The oculars are 1–3 except in two instances, in one specimen (No. 6,123) they are 1–4 on both sides, in another (No. 6,235) they are 2–3 on the right side and normal on the left; the supralabials remain constantly 8 for all the specimens and the eye rests on the 4th and 5th supralabials; the infralabials are 10 except in two specimens where 11 were recorded on the right side. The temporals are usually 1–2, rarely 1–3; if the third row be counted, it may be 2 or 3 or rarely 4 in number. All in all, the relationships of *T. proximus*, *sauritus* and *sackeni* become closer as possible intergrading localities are studied, and no distinction proves so constant as the supralabial character which is not absolute.

Habits.—This attractive snake is, to our minds, even more aquatic than *T. sauritus*, and may be found about the open water courses, on the open "prairies," along the wooded parts of the Suwanee

River, in the moist situations of the wooded parts of the islands, if not also in the dense cypress thickets. It is beautiful and is extremely lithe of body. It frequents the edges of the little "houses" or islets on the prairies, coursing among the water plants like a true water snake. Of its expert swimming ability we had one fine illustration. On the widest part of Billy's Lake we noticed a small snake several rods ahead. It was halfway across in its course. We raced to head it off, and swift and straight it did make its course. It had almost reached the other shore when one of us hit at it, only to see it dive deftly. It remained under water for a short time and soon reappeared on its back trail. We circled slowly towards it and when near it stopped. It came immediately to the boat, apparently more from curiosity than from exhaustion. This species must be accredited with very good aquatic skill and endurance.

Food.—Its food is mainly small aquatic animals. In one specimen were insect remains. Frogs seem to be a prominent food with this species. Four of the ten had eaten frogs, one having two southern meadow frogs (*Rana pipiens sphenocephala*) in its stomach and another had one of this same species. Another snake had captured the cricket frog (*Acris gryllus*) and a fourth had eaten a pine-wood's tree frog (*Hyla femoralis*), all these frogs except the last suggesting an aquatic foraging ground for the species. Besides the frogs, there were indications that they occasionally eat fish and other animals of the water.

Breeding.—Three specimens taken in the early part of July showed the egg development to be not far advanced. One had 5 eggs, another 8 and one 10. The number of young of this ovoviviparous snake is comparatively few and must be born in late summer or early fall.

Parasites.—This species and its relative, *T. sirtalis ordinatus*, were badly afflicted by internal parasites. In one specimen there were parasites in the stomach, others partly in the abdominal cavity and partly through the peritoneum and still others solely between the peritoneum and the skin. In another specimen these occur in the cephalic region and appear from the outside like large protuberances. They lie just beneath the skin or imbedded in the muscles.

17. **Thamnophis sirtalis ordinatus** (Linnæus): "Highland Moccasin"; Garter Snake; Common Garter Snake; Grass Snake; Little Green Grass Snake; Spotted Garter Snake.

The garter snake is common in the swamp, and the local name, "highland moccasin," indicates that the natives consider it more upland and terrestrial than the *Natrices* or *Thamnophis s. sackeni*.

Coloration.—The specimens at hand all correspond very closely with *T. sirtalis ordinatus* (Linnæus), though our use of the subspecific name above does not commit us to full recognition of the worth of this subspecies. The lateral stripe is absent or very indistinct in one or two specimens. The dorsal stripe is very distinct in only one specimen (No. 6,221). In all the others it is entirely absent or indistinct. In some specimens the three rows of spots of each side show very beautifully; on the venter the snakes are bluish-gray, except for the throat and chin which are yellowish-white. There is a black spot near the end of each gastrostege. In some specimens the cephalic gastrostegal borders are black and thus connect the gastrostegal spot of either end of the gastrostege. In two specimens these spots are practically absent or obscured. One example, the largest, is melanistic in appearance and the end of each gastrostege and its gastrostegal spot is covered with the dark body color. In all the supralabials are dark edged, but the infralabials are immaculate except in two or three of the largest specimens, where there are dark edges as on the supralabials.

Dimensions and Variations.—The fifteen specimens vary in length from 32.7–78.2 cm. (13–28½ inches); the tail is 7–17.6 cm. or $3\frac{9}{10}$–$4\frac{4}{5}$ in the total length (average $4\frac{3}{10}$); the gastrosteges have a small range from 136–146, or average 141 (ten of the fifteen have 141 or 140); the urosteges are 66–77, or average 70. The scale rows are very constant, being 19–19–17, except in No. 6,223 where they are 19–19–15; the supralabials 7; the infralabials 10 except in one case of 11. In all the loreal is present and the oculars are consistently 1–3, except in two specimens where they are 1–4 on one side; six of the specimens have the temporals 1–2 on both sides, one specimen 1–3 on both sides, and eight specimens with the temporals 1–2 on one side and 1–3 on the other side. The anal plate is entire.

Breeding.—Of this ovoviviparous snake we took only two females with embryos developing. The largest specimen (No. 6,160), taken June 26, 1912, had 25 embryos or eggs little advanced in development. Another small specimen had only 8 embryos in it. From the condition of these eggs, birth could not come before the middle of August or later as with our garter of the North.

Food.—This form was found to be one of the most terrestrial of the snakes of the swamp, both in the places where captured and by local reputation and by examination of their food contents. One snake had eaten the small dwarf or oak toad (*Bufo quercicus*) and another had two of this species. In two instances, the larger southern

toad (*Bufo l. lentiginosus*) proved the prey. Two others had eaten the narrow-mouthed frog (*Engystoma carolinense*) and the pine-wood's tree frog (*Hyla femoralis*). In two specimens many small beetles were found in the stomachs with the frogs and one had nothing but beetles. All except one of the specimens with food had Anura, and beetles seemed the second important food of this species.

Parasites.—Three of these snakes were afflicted with internal parasites. The natives call this species "highland moccasin," because of its habitat and because of its supposed poisonous nature. Certainly, it is strange that in their crude way this observing and simple people should have associated it with *Tropidonotus*, as they surely do in calling it "highland moccasin," in contradistinction to "water moccasin."

18. Ancistrodon piscivorous Lacepede: "Moccasin"; "Green-tailed Moccasin"; Water Moccasin; Cotton-mouth Moccasin; Cotton-mouth; Stump-tailed Moccasin. Fig. 14.

The water moccasin is common in the swamp. In the three collections from the swamp we have sixteen specimens, seven taken between May 29–July 15, 1912, seven from July 15–November 1, 1912, and two taken in the fall of 1913.

Coloration.—The smallest specimen taken, measuring 38.3 cm., shows a decided similarity to *A. contortrix* in coloration, only the body color is more brownish than the light brown or drab of the copperhead. There are thirty-two vertical bars in twos, these individual bars being one or two scales wide. In the cephalic half of the body two bars of one side alternate with two of the other side. Two bars form a diamond inclosing an area of the lighter body color. In this lighter area there is usually a small spot of color like the bars. In the caudal half of the body the two bars of one side may be opposite two of the other side and unite across the back, making a cross-band. On the tail are seven cross-bands. The caudal half of the tail, both dorsum and venter, is greenish-yellow in this small specimen. This stage of the moccasin the natives consider another species, "the green-tailed moccasin." Opposite the intervals between two sets of bars and opposite the space inclosed by two bars there is on the end of the gastrostege a black spot $1\frac{1}{2}$ the width of the gastrostege. In the front half of the body the black spots of one side of the venter alternate with those of the other side. In the caudal region where the sets of bars are opposite each other as are the intervals, these gastrostegal spots also are opposite, merge and are not so conspicuous. As the snakes get older the dark ventral blotches become less distinct and the yellow or yellowish-white ground color of the venter

more dominant, the cross-bands of the back almost disappear or persist last in the cephalic half of the body, also occasionally near the anus. In all (except two) of the large specimens the tail is perfectly black on the venter, and this usually extends ahead of the anus for 20–30 gastrosteges; in one large specimen (No. 6,214) the same ventral area both ahead of the anus and on the underside of the tail was merely heavily blotched with black. In the young specimens the labials are heavily marked with rich brown which is more or less obscure in adults. Usually the upper labials in the adults are immaculate or with few dark spots, but the infralabials retain more or less of the brownish markings of the young stage. The postocular brown band bordered below by the yellowish labial line and above by a pale streak is persistent in all.

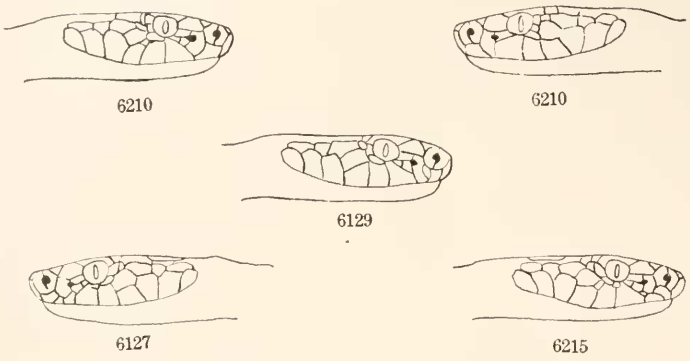

Fig. 14.—*Ancistrodon piscivorus* Lacep.

Dimensions and Variations.—These specimens vary in length from 38.3–96.7 cm., the tail 6.5–15.1 cm., or usually 6 times in the total length, the range being $5\frac{1}{2}$–$6\frac{1}{4}$ times; the gastrosteges are 133–144, the average 141; the urosteges 45–52, the average 48; anal entire; usually the first urostege is divided, then follows 25–30 entire individual urosteges, with the remaining caudal ones divided. The strongly keeled scale rows range from 28–25–23 to 25–25–21, in all the count being 25 around the middle of the body; usually the supralabials are 8 in number, five of the sixteen specimens, however, have variations. One has 7 on the right side and 9 on the left side, two specimens 9 and 8 and two 8 and 7; the 3d and 6th supralabials are largest; eye resting on the 3d, except in three instances where 9 supralabials occur. Then, the eye rests on the 4th, because the extralabial comes in the normal second or third area. The approach

to *Toxicophis pugnax* B. and G. is carried even closer in several. In No. 6,210 with 7–8 supralabials the triangular point of the second labial has been forced just above the labial border on the right side and on the left side just reaches it; in Nos. 6,213 on the left side and 6,133 on the right side it enters the labial border, while in No. 6,129 the point is just excluded from the border. The infralabials range from 10–11, the latter number predominating. Besides the inferior loreal, this species occasionally has another loreal in front of the pit, as in the copperhead, and the absence of this plate is not so constant for *A. piscivorus* as it might be thought. In No. 6,215 it appears on both sides cut off from supralabial No. 2; in No. 6,127 it appears on the left side; in Nos. 6,130 and 6,132 it is on the right side. Thus, in five of the sixteen this distinguishing character between *A. contortrix* and *A. piscivorus* appears in the latter. The temporals may be 2–2, 3–3, 4–4, 4–5, 5–4, 6–4, 6–5. The oculars are usually 2–3, though 2–2, 2–4, 3–2, 3–3, 3–4 and 4–3 also occur.

Habits.—The "moccasin" is the Crotaline snake of the swamp. It frequents the thickety edges of the cypress ponds on the islands, occurs around the wooded edges of the water stretches and where the woods of the island's border meet the piney woods, also along the water-courses and quite generally through the swamp. On the prairies they are not so common as in the wet, woody parts. They lie on the little hummocks above the water and slide in at one's approach. The Okefinokee Swamp is no place for the collector who has been reared in harmless snake country where the method of capture is to step on your prey. One of the authors instinctively tried it on a supposed *T. taxispilotus*, and fortunately just missed one of the biggest of the sixteen moccasins captured. They are rather sluggish, yet those who know poisonous snakes handle them very carefully. In spite of the presence of so many moccasins, the children go barefoot. On the hunting trips for bear and deer the men of the Lee family frequently travel all day barefoot, and Mr. Bryant Lee has twice been bitten in the large toe by a moccasin. In such cases, usually the dogs which are ahead avoid the snake, but the hunters immediately behind step on them. In both of these injuries the patient's leg and part of his side swelled to twice their normal proportions. He recovered from both experiences. These simple people could find no cure for it and in the second case thought some "Cuban relief" efficacious. We suspect the ingredients of this nostrum to be alcohol, although we are not positive of it. The presence of such creatures as alligators, alligator snappers and

moccasins do not deter the family from swimming. One day our whole camp and the male members of the Lee family took a swim at Billy's Lake landing, and soon a moccasin swam from one hummock to another through the party's midst and the snake was captured as well. In another instance one of the small boys came into camp with a large dead moccasin in one hand and a live spreading adder in the other. Upon inquiry we found that the boys went in bathing in a small pool 2 x 6 feet near their house only to find two large moccasins there before them. One they killed, the other escaped. These side lights which we would think make life precarious shows how the natives view existence in such an environment. None of our specimens is more than $6\frac{1}{2}$ inches in circumference, but the Lees assert that they reach 9 or 10 inches or even more. This snake is dangerous, pugnacious and ill-natured if tormented or pinned beneath a log or pushed into a corner, and care needs to be exercised after your game is supposedly dead, for the striking propensity is one of the last to leave the reflexive dead reptile. As one member of the party, a hater of snakes, said, "After it is dead, give it two more licks for safety's sake."

Breeding.—This snake is ovoviviparous. Two females taken June 10 and 22, 1912, respectively, each (Nos. 6,131, 6,130) had 5 embryos not far advanced. Another taken June 12, 1912 (No. 6,127), had 19 embryos in about the same stage, and another specimen (No. 6,213) taken between July 15 and November 1, 1912, had 5 embryos, some of which were not far from hatching.

Food.—The food of this species is considered to be fish, frogs and other aquatic animals. They seek the transient pools of the islands for stranded killifishes and tadpoles. One individual had a young soft-shelled turtle (*Platypeltis ferox*) in its stomach and others fish remains. The other individuals had each a frog (*Rana sp.*) in the stomach.

Parasites.—Several of the snakes had in the stomach and intestines parasites among the food and at other times the parasites alone. In fact, only the spreading adder excelled it in the number of specimens with parasites, six of the sixteen moccasins having them and these six being $\frac{1}{6}$ of all the snakes thus afflicted.

19. **Sistrurus miliarius** (Linnæus): Ground Rattler; Ground Rattlesnake; Small Rattlesnake; Pigmy Rattlesnake; Southern Pigmy Rattlesnake.

One specimen was taken May 31, 1912, four specimens from July 15–November 1, 1912, by the Lees, and another September, 1913, by Prof. J. C. Bradley and Paul Battle.

Coloration.—In coloration they agree very well with the descriptions for the species, the red vertebral line being very conspicuous, as are the three rows of alternating black spots of either side. The venter is whitish with numerous black blotches and spots.

Dimensions and Variations.—The measurements of the six are as follows:

No.	Gastrosteges	Urosteges.	Total length.	Tail.
6,243	143	27	35.1 cm.	3.7 cm.
6,244	136	36	25.5 "	3.3 "
6,245	132	34	23.5 "	3.5 "
6,246	143	31	48.3 "	6.0 "
6,247	135	33	52.3 "	6.5 "
6,109	146	32	39.5 "	5.0 "

No.	Scales.	Supralabials.	Infralabials.	Rattles.
6,243	23–23–20	10–11	11–11	2
6,244	22–21–21	10–10	11–11	1
6,245	21–21–19	10–11	11–11	1
6,246	23–23–17	10–10	11–11	5
6,247	25–23–18	10–10	11–11	3
6,109	25–23–17	10–10	11–11	5

In all the loreal between preocular and postnasal is present; the ocular ring of scales from 6–9 in number; the anal entire.

Habits.—This species apparently appears second in abundance of the four Crotalids recorded in the swamp, the moccasin exceeding it in abundance. It was the first form of the four to be seen and the first specimen was stepped upon and calmly picked up back of the neck by one member of the party, he not being aware that it was poisonous at all.

Breeding.—Like the other poisonous Crotalids this species is ovoviviparous, but the number of young is few, usually from five to nine being the range. One 14-inch specimen (No. 6,243) taken between July 15–November 1, 1912, has eight medium-sized embryos, the caudal one being the smallest. Another, the largest specimen (19 inches long), taken September, 1913, has nine embryos.

Food.—This species is supposed to feed on frogs and field mice. One individual had in its rectum the remains of several beetles, grasshoppers, spiders and the ribs and pieces of skin of a very small snake or lizard. Another specimen had in its stomach the hind legs and tail of the ground lizard (*Lygosoma laterale*), the tail pointing forward. This conforms to the rule with almost all the snakes of the Okefinokee collection. In almost every instance vertebrate

food is swallowed head first. The largest specimen (No. 6,251) had the stomach full of parasites and in the intestine just back of the stomach were a few more.

20. Crotalus adamanteus Beauvais: Diamond Rattlesnake; Diamond-back Rattlesnake; "Rattlesnake."

One specimen was taken during our stay in the swamp. On June 21, 1912, Mr. Jackson Lee secured it in the late afternoon in the Pocket. His dog had discovered it and Mr. Lee "crooned" (threw a chunk) it with a chunk of wood, but the rattles were broken off in the process. The specimen must have been $4\frac{1}{2}$-5 feet long, for the length to the anus is 115 cm. The gastrosteges are 181; anal entire; scales 29–27–21; three rows of scales between suboculars and labials; seven rows between supraoculars which are transversely ridged; loreal, one on the right side and two on the left side. Two or three other diamond-backs were killed on the west border of the swamp near Fargo while we were in the swamp.

This largest of our poisonous snakes proves a serious economic factor to the inhabitants of Okefinokee Swamp. The Lees assert that in 1910 alone they lost 10–15 head of hogs killed by this species and other rattlers. In some seasons the rattlers and bears combined compel the Lees to go outside the swamp for new hog stock. They further contend that hogs are not wholly immune, but that the hogs will eat dead rattlers, preferring the heads. At other times they eat the heads first and later the body, or in some instances the whole snake at once. They are not so certain that the hogs are such mortal enemies of the rattlers as they are reputed to be. In some seasons the rattlers are very common; during the season of 1912 they were scarce, as the one capture shows. They occur throughout the swamp. On Minne Lake Islands they are frequent. Doubtless this is due to the infrequent visits of the swamp's inhabitants who almost invariably record them there on their hunting trips, having counted as many as 14 on one expedition. On our last trip to the Minne Lake Islands one of the native dogs was bitten by a rattlesnake, but reached Billy's Island two days after our arrival. It travelled two miles throughout the thickest swampy tangle of the swamp, swam Billy's Lake and appeared with its fore leg badly swollen from the bite, but it soon recovered, as they frequently but not always do.

21. Crotalus horridus Linnæus: Banded Rattlesnake; Timber Rattlesnake; Common Rattlesnake; Rattlesnake; Cane Rattler; Cane-brake Rattler; "Siminole Rattler."

One specimen was recorded June 25, 1912, by Prof. J. C. Bradley and Mr. P. Battle on the short-cut trail to Gallberry Island. The

snake was about 5 feet long. In the collection made by Messrs. Jackson and Lemuel Lee, July 15–November 1, 1912, we have a fine specimen. The other specimen was secured in the fall of 1913 by J. C. Bradley and Paul Battle.

Coloration.—The coloration of the larger specimen (No. 6,255) is a pinkish-gray. In the cephalic end of the body there is on either side of the back and sides a series of three rows of alternate spots for a distance corresponding to four zigzag bands. The upper row of each side is separated from the one of the other side by a reddish-yellow band 3 scales wide which runs along the middle of the back for quite a distance until the chevron bands begin. Then it continues along the back between the chevron spots almost to the anus. This dorsal band shows better in the small specimen (No. 6,250). Beyond the series of three rows of alternating spots on the neck region come three bands which have not the lower row of spots united with them. Then follows 18 zigzag cross-bands to the anus and 4 on the tail, which is not completely black. The first of these four does not completely encircle the tail as the subsequent ones do. In the smaller specimen there are 5 black bands on the tail, the first three not complete on the venter, and ahead of the anus there are 26 bands, six of which are not wholly united. The median point of the chevron is directed backward and the angle on the sides points forward, the latter point usually being on the 7th–9th row of scales. The black bands are 2 scales wide and the ground-color intervals 5–6 scales wide. Occasionally half black bands appear with no counterpart on the other side. The venter is lighter than the back, yet heavily speckled with the ground color of the back. These specimens well agree with the so-called canebrake form of the South.

Dimensions and Variations.—The total length of the larger specimen is 118.7 cm., the tail 14.5 cm., or $8\frac{1}{2}$ in the total length, and with 14 rattles; anal entire; gastrosteges 178; the urosteges 22; scales 26–24–20; oculars 7; supralabials 14, the 4th the largest; infralabials 18 on the right side and 17 on the left side; two loreals. The smaller specimen is 38.5 cm. long; the tail 3.3 cm., or $11\frac{2}{3}$ in the total length; anal entire; scales 27–(23–25)–21; orbital ring 8 on one side and 7 on the other side; infralabials 14. In both specimens there are three rows of scales between the eye and the supralabials; the larger specimen has the first row of body scales smooth.

The natives described to us a large rattler as large as a diamond-backed rattler and called it the "Siminole rattler," which we pro-

visionally identified as *C. horridus*, and later Prof. J. C. Bradley's capture verified this identification in the fall of 1913. On Mixon's Hammock, June 16, 1912, we also found beneath an old roof on the ground the cast skin of this species.

Explanation of Plates I–III.

Plate I.—Fig. 1.—Carapace of *Platypeltis ferox.*
Fig. 2.—Carapace of *Platypeltis ferox.*
Fig. 3.—Skull of *Macroclemmys temminckii.*
Fig. 4.—Skull of *Platypeltis ferox.*
Fig. 5.—Skull of *Chelydra serpentina.*

Plate II.—Fig. 1.—Eggs of *Alligator mississippiensis.*
Fig. 2.—Eggs of *Cnemidophorus sexlineatus.*
Fig. 3.—Eggs of *Cinosternum pennsylvanicum.*
Fig. 4.—Eggs of *Chrysemys floridana.*
Fig. 5.—Eggs of *Chelydra serpentina.*
Fig. 6.—Eggs of *Platypeltis ferox.*

Plate III.—Fig. 1.—Ovarian egg of *Diadophis punctatus.*
Fig. 2.—Ovarian egg of *Elaphe obsoletus.*
Fig. 3.—Ovarian egg of *Cemophora coccinea.*
Fig. 4.—Embryos of *Haldea striatula.*
Fig. 5.—Egg of *Coluber constrictor.*
Fig. 6.—Egg of *Chrysemys floridana.*
Fig. 7.—Ovarian egg of *Heterodon platyrhinus.*